7 Steps to Specifying a DL205 System

The following 7 steps will help you specify a DL205 PLC system. They are also covered in more detail on the pages that follow. Your first priority when designing a system should be safety. Please make sure that all of the components in your system will operate within the product's environmental and operating specifications. This catalog is intended to provide abbreviated product descriptions, benefits and prices. It is not intended to be a substitute for the product manuals.

Before you begin selecting products for your DL205 PLC system, be sure to evaluate all of your application needs and any future growth potential.

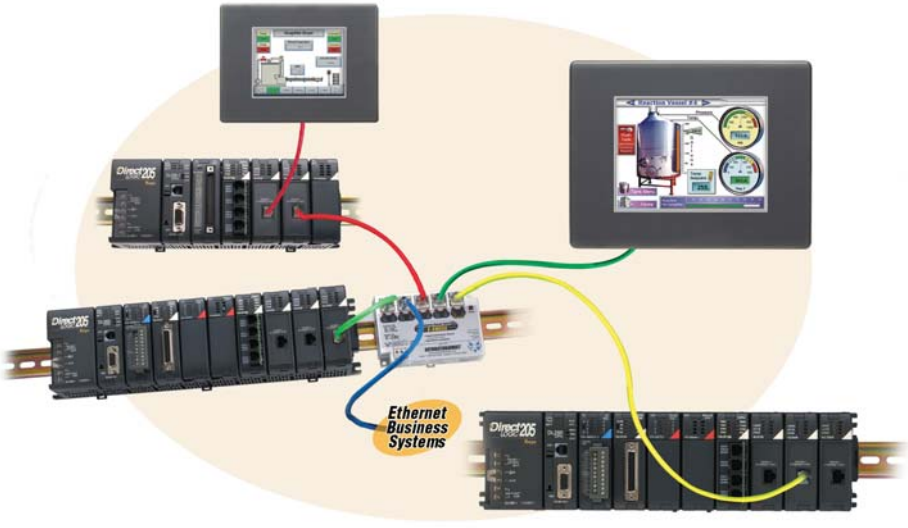
STEP 1 Review the DL205 family of products

The DL205 family offers a wide variety of products. Please review the product offering starting on page 4–23.

STEP 2 Select a CPU, programming tool and cable

The DL205 family offers four traditional CPUs: the D2-260, D2-250-1, D2-240 and D2-230. The WinPLC, a Windows® CE-based CPU, is also covered in this step. Please take the time to understand the features and specifications of each CPU model (i.e. built-in communications ports protocols, instructions, etc.).

To program the DL205 CPUs, choose between the Windows-based *Direct*SOFT programming software and PC cable or handheld programmer. The WinPLC requires Think & Do Studio or Think & Do Live! for programming. CPU-slot slave base controllers are also introduced in this step.



STEP 3 Additional communications ports needed?

If your application requires more than the built-in CPU communications ports, then select the H2-ECOM(100) Ethernet communications module, or the D2-DCM serial communications module. These modules add more ports for networking or connection to an HMI, etc. The H2-SERIO serial communications module can be used with the WinPLC to add more communications ports.

7 Steps to Specifying a DL205 System

Select the discrete, analog and specialty I/O modules

Since there are several different types of I/O and specialty modules available for the DL205 system, it is important to review the module specifications in detail when selecting them for your system. The hardware specifications for the modules are described at the end of the DL205 section, starting with the specialty modules and followed by the discrete and analog I/O modules.

Choose an I/O configuration method

The DL205 offers several configurations of I/O. Choose among local I/O, local expansion I/O and remote I/O. A DL205 system can be developed using a combination of the configuration arrangements. It is important to understand the octal addressing scheme and I/O module placement restrictions that are described in this step.

Check the power budget

It is very important to verify that the selected CPU and I/O modules will operate within the base power budget. Tables list the power supplied and consumed by each DL205 device. This step also describes base dimensions and mounting requirements.

Place your order!

Place your order either online at www.automationdirect.com, by calling 1-800-633-0405 or by faxing your order to 1-770-889-7876. See the Ordering section in this catalog for details.

Step 1: Review the DL205 Product Family

CPUs

D2-260 – 30.4K words total memory
2 communications ports
16 built-in PID loops with auto-tuning
D2-250-1 – 14.8K words total memory
2 communications ports
4 built-in PID loops with auto-tuning
D2-240 – 3.8K total memory
2 communications ports
D2-230 – 2.4K total memory
1 communications port
Windows CE CPUs -
WinPLC (H2-WPLC*-**)

Programming tools

DirectSOFT Programming Software for Windows Handheld Programmer (D2-HPP)

Bases

3-slot base (includes power supply)
110/220 VAC (D2-03B-1)
12/24 VDC (D2-03BDC1-1)
4-slot base (includes power supply)
110/220 VAC (D2-04B-1)
12/24 VDC (D2-04BDC1-1)
6-slot base (includes power supply)
110/220 VAC (D2-06B-1)
12/24 VDC (D2-06BDC1-1)
125 VDC (D2-06BDC2-1)
9-slot base (includes power supply)
1 10/220 VAC (D2-09B-1)
12/24 VDC (D2-09BDC1-1)
125 VDC (D2-09BDC2-1)

Local expansion modules

(D2-250-1 or D2-260 using D2-0*B-1 or D2-0*BDC*-1 only)
Base expansion module (D2-EM)
Expansion base controller module (D2-CM)
Expansion base cable (D2-EXCBL-1)

Discrete input modules

DC input
8-pt. 12-24 VDC sink/source (D2-08ND3)
16-pt. 24 VDC sink/source (D2-16ND3)
32-pt. 24 VDC sink/source (D2-32ND3)
32-pt. 5-12 VDC sink/source (D2-32ND3-2)

(Discrete inputs continued next column)

AC input
8-pt. 110 VAC (D2-08NA-1)
16-pt. 110 VAC (D2-16NA)
8-pt. 220 VAC (D2-08NA-2)

Discrete output modules

DC output
4-pt. 12-24 VDC sink (D2-04TD1)
8-pt. 12-24 VDC sink (D2-08TD1)
8-pt. 12-24 VDC source (D2-08TD2)
16-pt. 12-24 VDC sink (D2-16TD1-2)
16-pt. 12-24 VDC source (D2-16TD2-2)
16-pt. 24 VDC sink (Fault protected) (F2-16TD1P)
16-pt. 24 VDC source (Fault protected) (F2-16TD2P)
32-pt. 12-24 VDC sink (D2-32TD1)
32-pt. 12-24 VDC source (D2-32TD2)
AC output
8-pt. 18-220 VAC (D2-08TA)
8-pt. 20-125 VAC (F2-08TA)
12-pt. 18-110 VAC (D2-12TA)
Relay output
4-pt. 4A/pt (Isolated) (D2-04TRS)
8-pt. 1A/pt (D2-08TR)
8-pt. 10A/pt. (F2-08TR)
8-pt. 7A/pt (Isolated) (F2-08TRS)
12-pt. 1.5A/pt (D2-12TR)

Combination discrete modules

4-pt. 24 VDC in/4pt Relay Out (D2-08CDR)

Analog modules

Analog input
4-ch. in, 12 bit, current (F2-04AD-1)
4-ch. in, 12 bit, voltage (F2-04AD-2)
8-ch. in, 12 bit, current (F2-08AD-1)
8-ch. in, 12 bit, voltage (F2-08AD-2)
Analog output
2-ch. out, 12 bit, current (F2-02DA-1)
2-ch. out, 16 bit, current (Isolated) (F2-02DAS-1)
2-ch. out, 12 bit, voltage (F2-02DA-2)
2 -ch. out, 16 bit, voltage (Isolated) (F2-02DAS-2)
8-ch. out, 12 bit, current (F2-08DA-1)
8-ch. out, 12 bit, voltage (F2-08DA-2)
Combination analog in/out
4-ch. in/2-ch. out, 12 bit, current (F2-4AD2DA)
8-ch. in/4-ch. out, 16 bit, current (F2-8AD4DA-1)
8-ch. in/4-ch. out, 16 bit, voltage (F2-8AD4DA-2)

Temperature input
4-ch. in, RTD (F2-04RTD)
4-ch. in, Thermocouple (F2-04THM)

Communications/ networking modules

Ethernet Communications Module (H2-ECOM (-F))
(H2-ECOM 100)
Data Communications Module (D2-DCM)

Remote I/O modules

Ethernet
Ethernet Remote Master Module (H2-ERM(-F))
Ethernet Base Controller (slave) (H2-EBC(-F))
(H2-EBC 100)
Serial
Remote Master Module (D2-RMSM)
Remote Slave Module (D2-RSSS)

Specialty modules

Basic CoProcessor (F2-CP128)
8-pt. Input Simulator (F2-08SIM)
Counter I/O (H2-CTRIO)
Counter Interface (D2-CTRINT)

CPU-slot slave controllers

Ethernet Base Controller (H2-EBC)
DeviceNet Slave (F2-DEVNETS-1)
Profibus Slave (H2-PBC)
SDS Slave (F2-SDS-1)

Operator interface

See the ***C-more*** and HMI sections in this catalog for a complete line of compatible text and touch panels and configuration software.

Connection systems

See the Terminal Blocks and Wiring Solutions section in this catalog for information on **DIN***nector* terminal blocks, ***ZIP***Link connection systems and other connection accessories for use with the DL205 system.

Step 2: Select the CPU, Programmer and Cable

There are many things to consider when choosing a CPU, most of which depend on your particular application. The facing page provides a comparison between the CPUs. This section provides a quick summary of the key features for each CPU.

System capacity

System capacity is the ability of the CPU to accommodate a variety of applications. Consider both ladder memory and data registers (V-memory). For ladder memory, most Boolean instructions require one word. Some other instructions, such as timers, counters, etc. require two or more words.

Our V-memory locations are 16-bit words and are useful for data storage, etc.

If you think you may exceed 256 local I/O points, then select the D2-250-1 or the D2-260 CPU which support local expansion of up to two or four additional bases, respectively.

The D2-240, D2-250-1 and D2-260 support the Ethernet and serial Remote Master module that are used to build a remote I/O network. Port 2 on the D2-250-1 and D2-260 can also serve as a remote I/O master.

Performance

If you are using basic Boolean instructions and speed is not the primary concern, then the D2-230 or D2-240 will do the job. For applications that require fast scan times, additional communications or advanced instructions, choose the D2-250-1 or D2-260 CPU. The D2-260 is our fastest CPU for performing even the most basic of math or data instructions, and will provide better overall performance than the other DL205 CPUs.

Programming and diagnostics

Our CPUs offer an incredible array of instructions and diagnostic features that can save you many hours of programming and debug time. From basic Boolean contact logic to PID and floating point math, we have it covered! The table on the next page covers some of the basic instruction categories, but for more details, see our complete list of instructions at the end of this section. If you already have *Direct*SOFT and/or a Handheld Programmer, you may have to upgrade the software/firmware to accommodate the D2-260.

Built-in CPU communications

Every DL205 CPU provides at least one built-in RS-232 communication port. If you're using an operator interface, then you should choose the D2-240, D2-250-1 or D2-260 CPU. The D2-240, D2-250-1 and D2-260 CPUs offer two built-in communication ports. The D2-240 supports our *Direct*NET™ slave protocol on the bottom port, which provides a quick and easy network connection to any *Direct*NET master. If you need the most flexibility possible, then consider the D2-250-1 or D2-260 CPU. These CPUs offer built-in *Direct*NET slave support capability on the top and bottom ports, and *Direct*Net/Modbus RTU master/slave support on the bottom. The bottom port supports baud rates up to 38.4K baud. The D2-260 provides support for ASCII IN/OUT communications.

If you require more than two ports, we also offer an Ethernet Communications Module that can be used to quickly add a communication port to a DL205 system with a D2-240, D2-250-1 or D2-260 CPU. The D2-DCM module can also be added to these CPUs to provide an additional serial communications port.

DL 205 family CPUs

D2-260

D2-250-1

D2-240

D2-230

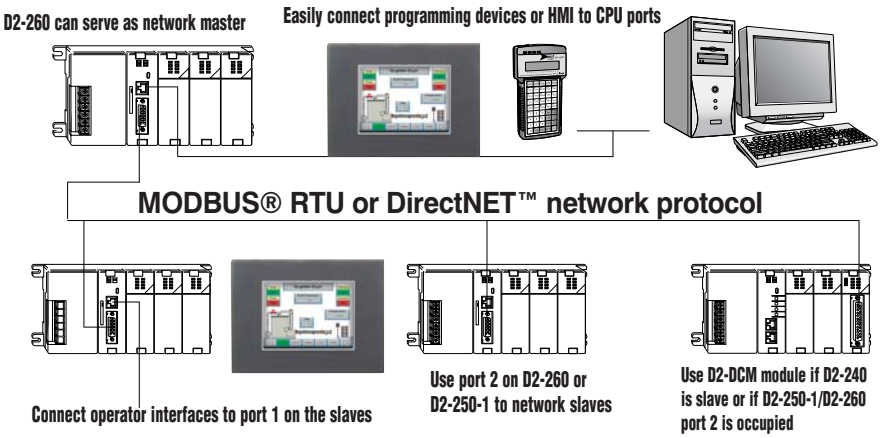
H2-WPLC*-**

The WinPLC brings PLC and PC technologies together by providing a Windows CE operating system environment for DL205 hardware. See the WinPLC pages later in this section for details on the WinPLC.

DL205 CPU Specifications

DL205 CPU Comparison				
System Capacity	**D2-230**	**D2-240**	**D2-250-1**	**D2-260**
Total memory available (words)	2.4K	3.8K	14.8K	30.4
Ladder memory (words)	2048 EEPROM	2560 EEPROM	7680 Flash	15872 Flash
V-memory (words)	256	1024	7168	14592
Battery backup	Yes	Yes	Yes	Yes
Total CPU memory I/O pts. available *(actual I/O pts. depend on I/O configuration method selected)*	256	896 (320 X + 320 Y + 256 CR)	2048 *(512 X + 512 Y + 1024 CR)*	8192 *(1024 X + 1024 Y + 2048 CR + 2048 GX + 2048 GY)*
Local I/O (pts.)	256	256	256	256
Local Expansion I/O (pts.)	none	none	768 (2 exp. bases max) *(Including local I/O)*	1280 (4 exp. bases max.) *(Including local I/O)*
Serial Remote I/O (pts.)	N/A	896 max. *(Including local I/O)*	2048 max. *(Including local and exp.I/O)*	8192 max. *(Including local & exp. I/O)*
Remote I/O channels	N/A	2	8 (7+1 CPU port)	8 (7+1 CPU port)
I/O per remote channel	N/A	2048 *(limited to 896)*	2048	2048
Ethernet Remote I/O	N/A	Yes	Yes	Yes
Discrete I/O pts.	N/A	896 max. *(Including local I/O)*	2048 max. *(Including local and exp.I/O)*	8192 *(Including local and exp.I/O)*
Analog I/O channels	N/A	Map into V-memory	Map into V-memory	Map into V-memory
Remote I/O channels	N/A	Limited by power budget	Limited by power budget	Limited by power budget
I/O per remote channel	N/A	16,384 *(limited to 896)*	16,384 (16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions)	16,384 (16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions)
Performance				
Contact execution (Boolean)	3.3µs	1.4µs	0.61µs	0.61µs
Typical scan (1K Boolean)	4-6ms	10-12ms	1.9ms	1.9ms
Programming and Diagnostics				
RLL Ladder Style	Yes	Yes	Yes	Yes
RLL^{PLUS}/Flowchart Style (Stages)	Yes/256	Yes/512	Yes/1024	Yes/1024
Run time editing	Yes	Yes	Yes	Yes
Variable/fixed scan	Variable	Variable	Variable	Variable
Instructions	113	129	174	231
Control relays	256	256	1024	2048
Timers	64	128	256	256
Counters	64	128	128	256
Immediate I/O	Yes	Yes	Yes	Yes
Subroutines	No	Yes	Yes	Yes
For/Next loops	No	Yes	Yes	Yes
Timed Interrupt	No	Yes	Yes	Yes
Integer Math	Yes	Yes	Yes	Yes
Floating-point Math	No	No	Yes	Yes
Trigonometric functions	No	No	No	Yes
Table Instructions	No	No	No	Yes
PID	No	No	Yes, 4 loops	Yes, 16 loops
Drum Sequencers	No	No	Yes	Yes
Bit of Word	No	No	Yes	Yes
ASCII Print	No	No	Yes	Yes
Real-time clock/calender	No	Yes	Yes	Yes
Internal diagnostics	Yes	Yes	Yes	Yes
Password security	Yes	Multi-level	Multi-level	Multi-level
System and user error log	No	No	Yes	Yes
Communications				
Built-in ports	Port 1 RS-232	Port 1 RS-232 and Port 2 RS-232	Port 1 RS-232 and Port 2 RS-232/422	Port 1 RS-232 and Port 2 RS-232/422/485)
K-sequence (proprietary protocol)	Yes	Yes	Yes	Yes
*Direct*NET™	No	Yes	Yes	Yes
Modbus RTU master/slave	No	No	Yes	Yes
ASCII communications	No	No	OUT	IN/OUT
Maximum baud rate	9600	19.2K port 2	38.4K port 2	38.4K port 2

D2-260 Key Features


D2-260 can serve as network master
Easily connect programming devices or HMI to CPU ports
MODBUS® RTU or DirectNET™ network protocol
Connect operator interfaces to port 1 on the slaves
Use port 2 on D2-260 or D2-250-1 to network slaves
Use D2-DCM module if D2-240 is slave or if D2-250-1/D2-260 port 2 is occupied

D2-260: Our most powerful DL205 CPU

Our D2-260 CPU provides all the capabilities of the other DL205 CPUs (as well as our D4-450 CPU), plus several additional features rarely found in a PLC of this size. With such an incredible array of features, you may be able to replace PLCs costing hundreds (or thousands) more.

Release 4.0 or higher of *Direct*SOFT is required to program the D2-260. If you're using a handheld programmer, version 2.10 of the handheld programmer firmware is required. Here are a few key features about the D2-260 CPU:

Local expansion I/O

The D2-260 supports local expansion up to five total bases (one CPU base and four expansion bases). Expansion bases are commonly used when there are not enough slots available in the CPU base, when the base power budget will be exceeded, or when placing an I/O base at a location away from the CPU base (but within the expansion cable limits). All local and expansion I/O points are updated on every CPU scan. Each local expansion base requires the D2-CM module in the CPU slot. The local CPU base requires the D2-EM Expansion Module, as well as each expansion base. For more information on local expansion, refer to the Expansion Modules pages later in this section.

Powerful built-in CPU communications

The D2-260 offers two communications ports that provide a vast array of communication possibilities. The top RJ-12 RS-232 port can be used for connection to a *C-more* or DV-1000 operator interface panel, or as a single K-sequence or *Direct*NET slave. The 15-pin bottom port (port 2) supports RS-232 or RS-422/RS485. This port offers several different protocol options such as:

- K-sequence
- ***Direct***NET Master/Slave
- Modbus RTU Master/Slave
- ASCII In/Out Communications

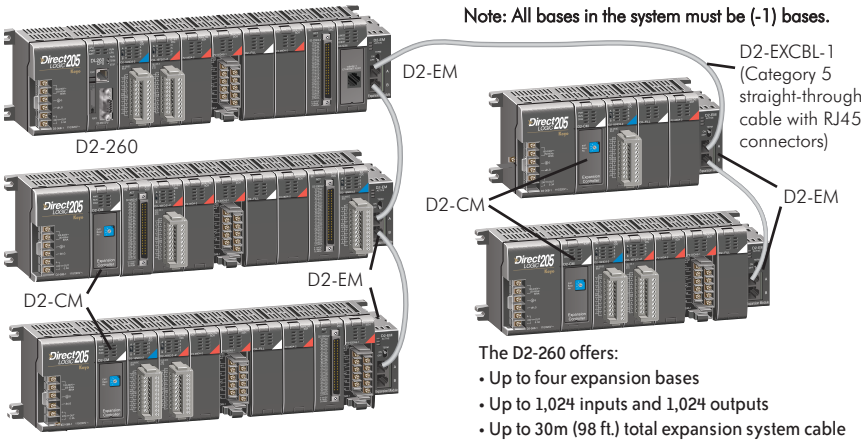
Port 2 can also serve as a remote I/O master. The D2-260 supports the Ethernet Communication module and Data Communication Module for additional communications ports.

16 PID loops with auto-tuning

The D2-260 CPU can process up to 16 PID loops directly in the CPU. You can select from various control modes including automatic, manual, and cascade. There are also a wide variety of alarms including Process Variable, Rate of Change, and Deviation. The loop operation parameters (Process Variable, Setpoint, Setpoint Limits, etc.) are stored in V-memory, which allows easy access from operator interfaces or HMIs. Setup is accomplished with easy-to-use setup menus and monitoring views in *Direct*SOFT programming.

The auto-tuning feature is easy to use and can reduce setup and maintenance time. Basically, the CPU uses the auto- tuning feature to automatically determine near optimum loop settings. See the D2-250-1 CPU section for a PID loop control block diagram.

D2-260 local expansion system



The D2-260 offers:

- Up to four expansion bases
- Up to 1,024 inputs and 1,024 outputs
- Up to 30m (98 ft.) total expansion system cable

D2-260 Key Features

Full array of instructions

The right instruction can greatly simplify your programming task and can save hours of programming time.

The D2-260 supports over 280 powerful instructions, such as:

- Four types of drum sequencers
- Leading / trailing edge triggered one-shots
- Bit-of-word manipulation
- Floating point conversions
- Trigonometric functions
- Table instructions
- ASCII IN/OUT instructions

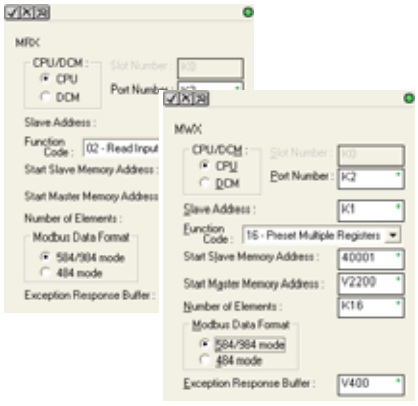
For a complete list of instructions supported by all DL205 CPUs, see the end of this section.

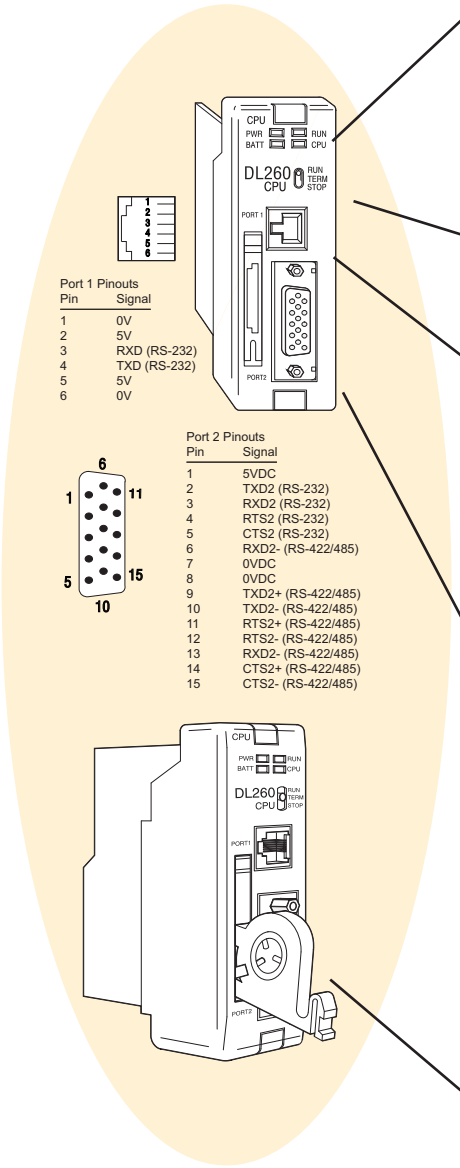
Modbus RTU instructions

The D2-260 CPU supports easy-to-use Modbus Read/Write instructions that expand our existing Modbus network instruction capabilities. The MRX or MWX instructions allow you to enter native Modbus addressing in your ladder program with no need to perform octal-to-decimal conversion. We added Function codes 05, 06 and the ability to read Slave Exception Codes. These flexible instructions allow the user to select the following parameters within one instruction window:

- 584/984 or 484 Modbus data type
- Slave node (0-247)
- Function code
- Modbus starting master / slave memory address
- Number of bits
- Exception code starting address

Examples of MRX and MWX instructions in DirectSOFT





Port 1 Pinouts

Pin	Signal
1	0V
2	5V
3	RXD (RS-232)
4	TXD (RS-232)
5	5V
6	0V

Port 2 Pinouts

Pin	Signal
1	5VDC
2	TXD2 (RS-232)
3	RXD2 (RS-232)
4	RTS2 (RS-232)
5	CTS2 (RS-232)
6	RXD2- (RS-422/485)
7	0VDC
8	0VDC
9	TXD2+ (RS-422/485)
10	TXD2- (RS-422/485)
11	RTS2+ (RS-422/485)
12	RTS2- (RS-422/485)
13	RXD2- (RS-422/485)
14	CTS2+ (RS-422/485)
15	CTS2- (RS-422/485)

CPU Status Indicators		
RUN	ON	CPU is in RUN mode
	OFF	CPU is in PROGRAM mode
BATT	ON	Battery backup voltage is low
	OFF	Battery backup voltage is OK or disabled
CPU	ON	CPU internal diagnostics detects error
	OFF	CPU is OK
PWR	ON	CPU power good
	OFF	CPU power failure
Mode Switch		
RUN		Puts CPU into RUN mode
TERM		Allows peripherals (HPP, *Direct*SOFT) to select the mode of operation
STOP		Forces CPU out of RUN mode
Port 1		
Protocols		K-sequence slave, *Direct*NET™ slave, Modbus RTU slave
Devices		Can connect w/HPP, *Direct*SOFT, *C-more*, DV-1000, O/I panels, or any *Direct*NET master
Specs.		6P6C phone jack connector RS-232 9,600 baud Fixed address Odd parity only 8 data bits one start, one stop asynchronous, half-duplex, DTE
Port 2		
Protocols		K-sequence slave, *Direct*NET Master/Slave, Modbus RTU Master/Slave, ASCII IN/OUT, Remote I/O Master
Devices		Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, DV-1000, other O/I panels, any *Direct*NET or Modbus RTU master or slave, or ASCII devices
Specs.		HD15 connector RS-232, RS-422/485* 300/600/1200/2400/4800 9600/19.2K/38.4K baud Odd, even, or no parity Selectable address (1-90, HEX 1 – 5A) 8 data bits, one start, one stop Asynchronous, Half-duplex, DTE
Battery (Optional)		
D2-BAT-1		Coin type, 3.0V Lithium battery, 560mA, battery number CR2354

Note: Batteries are not needed for program backup. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage.
****RS485 for Modbus protocol only***

*ZIP*Link communications adapter modules

*ZIP*Link cables and communications adapter modules offer fast and convenient screw terminal connections for the D2-260 bottom port. They are RS-232/422 DIP switch selectable. See the Terminal Blocks and Wiring section in this catalog for *ZIP*Link part numbers and descriptions

DN-15TB

On-board memory

The D2-260 has 15.5K words of flash memory on board for your program plus 14.2K words of data registers. With flash memory, you don't have to worry about losing the program due to a bad battery.

Built-in remote I/O connection

The bottom port on the D2-260 can be used as a master for serial remote I/O networks (see the D2-RSSS later in this section for details).

D2-260 Key Features

ASCII communications instructions

The D2-260 CPU supports several easy-to-use instructions that allow ASCII strings to be read into and written from the PLC communications ports.

Raw ASCII: Port 2 can be used for either reading or writing raw ASCII strings, but not for both.

Embedded ASCII characters: The D2-260 can decipher ASCII embedded within a supported protocol (K-Sequence, *Direct*Net, Modbus, Ethernet) via the CPU ports, H2-ECOM or D2-DCM.

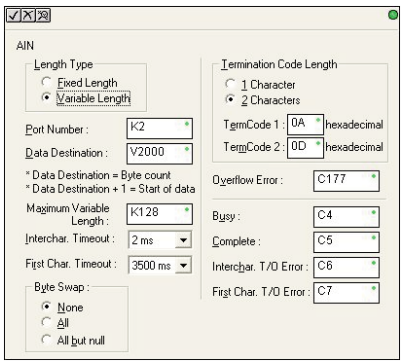
Here's how the D2-260 can receive ASCII input strings:

1. ASCII IN (AIN) - This instruction configures port 2 for raw ASCII input strings with parameters such as fixed and variable length ASCII strings, termination characters, byte swapping options, and instruction control bits. Use barcode scanners, weight scales, etc. to write raw ASCII input strings into port 2 based on the (AIN) instruction's parameters.
2. Write embedded ASCII strings directly to V-memory from an external HMI or similar master device via a supported communications protocol using the CPU ports, H2-ECOM or D2-DCM. The AIN instruction is not used in this case.
3. If a D2-260 PLC is a master on a network, the Network Read instruction (RX) can be used to read embedded ASCII data from a slave device via a supported communications protocol using port 2, H2-ECOM or D2-DCM. The RX instruction places the data directly into V-memory.

Here's how the D2-260 can write ASCII output strings:

1. Print from V-memory (PRINTV) - Use this instruction to write raw ASCII strings out of port 2 to a display panel or a serial printer, etc. The instruction features the starting V-memory address, string length, byte swapping options, etc. When the instruction's permissive bit is enabled, the string is written to port 2.
2. Print to V-memory (VPRINT) - Use this instruction to create pre-coded ASCII strings in the PLC (i.e. alarm messages). When the instruction's permissive bit is enabled, the message is loaded into a pre-defined V-memory address location. Then the (PRINTV) instruction may be used to write the pre-coded ASCII string out of port 2. American, European and Asian Time/Date stamps are supported.
3. Print Message (PRINT) - This existing instruction can be used to create pre-coded ASCII strings in the PLC. When the instruction's permissive bit is enabled, the string is written to port 2. The VPRINT/PRINTV instruction combination is more powerful and flexible than the PRINT instruction.
4. If a D2-260 PLC is a master on a network, the Network Write instruction (WX) can be used to write embedded ASCII data to an HMI or slave device directly from V-memory via a supported communications protocol using port 2, H2-ECOM or D2-DCM.

Example AIN instructionin DirectSOFT



Additional instructions that help manage the ASCII strings

The following instructions can be very helpful in managing the ASCII strings within the CPU's V-memory:

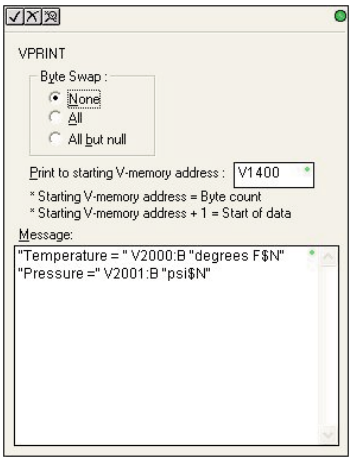
ASCII Find (AFIND) - Finds where a specific portion of the ASCII string is located in continuous V-memory addresses. Forward and reverse searches are supported.

ASCII Extract (AEX) - Extracts a specific portion (usually some data value) from the ASCII find location or other known ASCII data location.

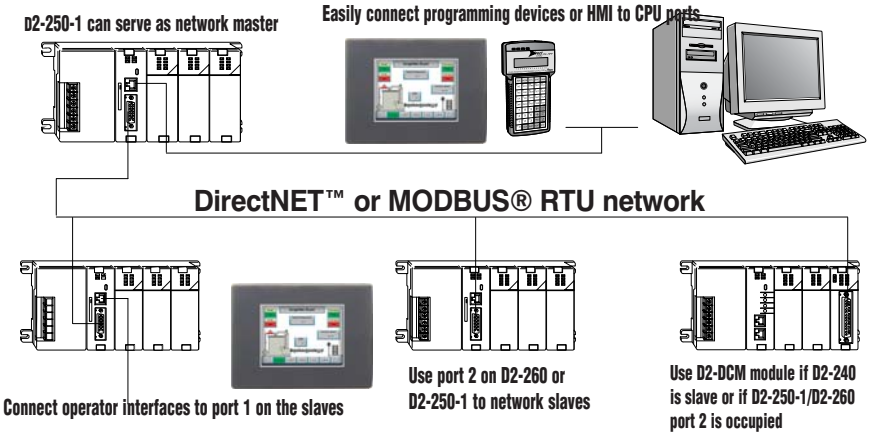
Compare V-memory (CMPV) - This instruction is used to compare two blocks of V-memory addresses and is usually used to detect a change in an ASCII string. Compared data types must be of the same format (i.e. BCD, ASCII, etc.).

Swap Bytes (SWAPB) - Usually used to swap V-memory bytes on ASCII data that was written directly to V-memory from an external HMI or similar master device via a communications protocol. The AIN and AEX instructions have a built-in byte swap feature.

Example of VPRINT instruction in *Direct*SOFT


VPRINT
Byte Swap :
None
All
All but null
Print to starting V-memory address : V1400
* Starting V-memory address = Byte count
* Starting V-memory address + 1 = Start of data
Message:
"Temperature = " V2000:B "degrees F$N"
"Pressure =" V2001:B "psi$N"

D2-250-1 Key Features


D2-250-1 can serve as network master
Easily connect programming devices or HMI to CPU ports
DirectNET™ or MODBUS® RTU network
Connect operator interfaces to port 1 on the slaves
Use port 2 on D2-260 or D2-250-1 to network slaves
Use D2-DCM module if D2-240 is slave or if D2-250-1/D2-260 port 2 is occupied

D2-250-1 replaces D2-250

Our D2-250-1 CPU replaces the D2-250 CPU. The D2-250-1 offers all the features and functionality of the D2-250 with the addition of local I/O expansion capability. The D2-250-1 offers an incredible array of features for a CPU that costs so little.

Release 2.1 or higher of *Direct*SOFT is required to program the D2-250-1. Release 4.0 or higher is required if you intend to use local expansion I/O.

If you're using a handheld programmer, at least version 2.10 of the handheld programmer firmware is required.

A few key features of the D2-250-1 CPU follow.

Local expansion I/O

The D2-250-1 supports local expansion up to three total bases (one CPU base and two expansion bases). Expansion bases are commonly used when there are not enough slots available in the CPU base, when the base power budget will be exceeded or when placing an I/O base at a location away from the CPU base, but within the expansion cable limits. All local and expansion I/O points are updated on every CPU scan. Each local expansion base requires the D2-CM module in the CPU slot. The local CPU base requires the D2-EM Expansion Module, as well as each expansion base. For more information on local expansion, refer to the Expansion Modules pages later in this section.

Powerful built-in CPU communications

The D2-250-1 offers two communication ports that provide a vast array of communication possibilities. The top RS-232 port is for programming, connection to a *C-more* operator interface panel or DV-1000, or to serve as a single *Direct*NET slave. The 15-pin bottom port (port 2) supports RS-232 or RS-422. This port offers several different protocol options such as:

- K-sequence
- ***Direct***NET master/slave
- Modbus RTU master/slave

Port 2 can also serve as a remote I/O master. The D2-250 supports the Ethernet Communication Module and Data Communication Module for additional communications ports.

Four PID loops with auto-tuning

The D2-250-1 CPU can process up to 4 PID loops directly in the CPU. You can select from various control modes including automatic, manual, and cascade control. There are a wide variety of alarms including Process Variable, Rate of Change, and Deviation. The loop operation parameters (Process Variable, Setpoint, Setpoint Limits, etc.) are stored in V-memory, which allows easy access from operator interfaces or HMIs. Setup is accomplished with easy-to-use setup menus and monitoring views in *Direct*SOFT programming.

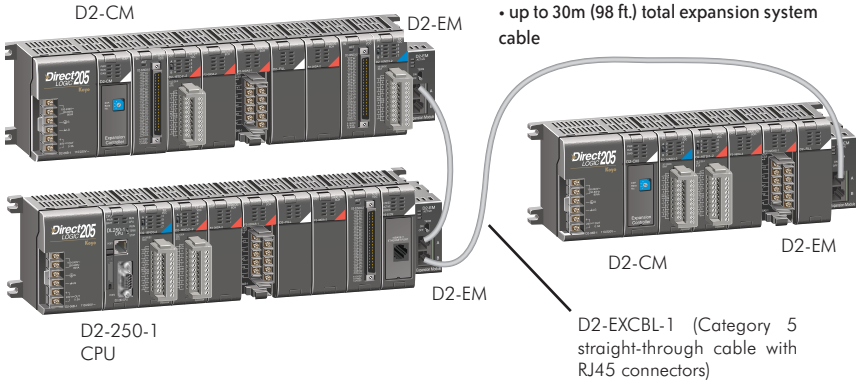
The auto-tuning feature is easy to use and can reduce setup and maintenance time. Basically, the CPU uses the auto-tuning feature to automatically determine near optimum loop settings. See the next page for a PID loop control block diagram.

D2-250-1 local expansion system

Note: All bases in the system must be (-1) bases.

The D2-250-1 offers:

- up to two expansion bases
- up to 768 physical I/O points
- up to 30m (98 ft.) total expansion system cable



D2-250-1 Key Features

Full array of instructions

The D2-250-1 supports over 210 powerful instructions, such as:

- Four types of drum sequencers
- Leading and trailing edge triggered one-shots
- Bit-of-word manipulation
- Floating point conversions
- Four PID loops

For a complete list of instructions supported by all DL205 CPUs, see the end of this section.

On-board memory

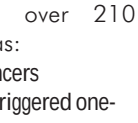
The D2-250-1 has 7.6K words of flash memory on board for your program plus 7.1K words of V-memory (data registers). With flash memory, you don't have to worry about losing the program due to a bad battery. If you have critical data stored in the capacitor backed V-memory, simply purchase the optional lithium battery (D2-BAT-1) to permanently maintain these parameters.

Built-in remote I/O connection

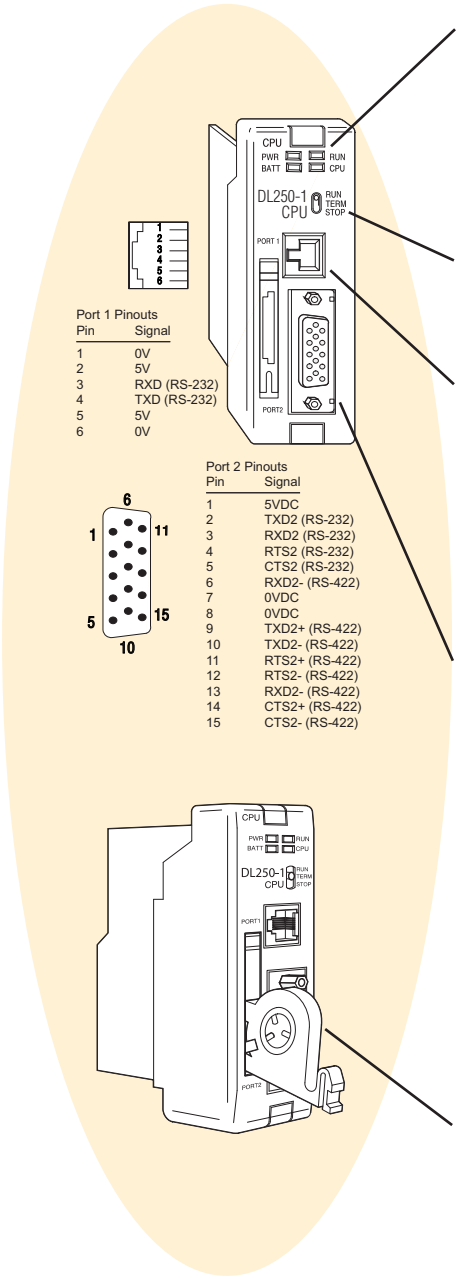
In addition to providing outstanding communications capabilities, the bottom port on the D2-250-1 can also be a master for remote I/O networks. If you need extra I/O at a remote distance from the CPU, you can use this port to add up to seven of our remote slave stations (see the D2-RSSS for additional information later in this section.)

*ZIP*Link communications adapter modules

*ZIP*Link cables and communications adapter modules offer fast and convenient screw terminal connections for the D2-250-1 lower port. They are RS232/422 DIP switch selectable. For part numbers and descriptions, see the Terminal Blocks and Wiring section.

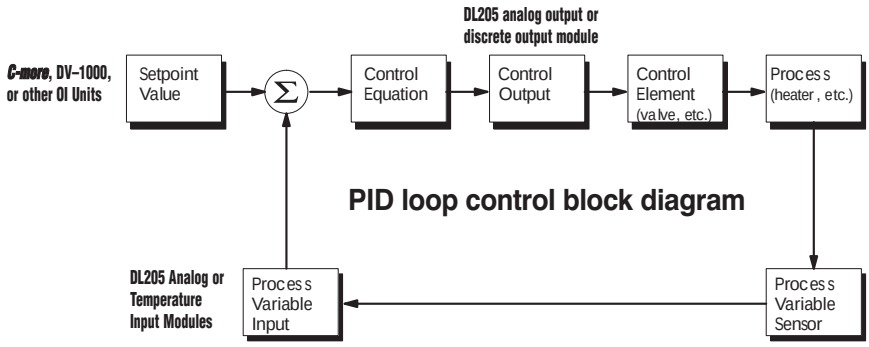


DN-15TB



CPU Status Indicators		
RUN	ON	CPU is in RUN mode
	OFF	CPU is in PROGRAM mode
BATT	ON	Battery backup voltage is low
	OFF	Battery backup voltage is OK or disabled
CPU	ON	CPU internal diagnostics detects error
	OFF	CPU is OK
PWR	ON	CPU power good
	OFF	CPU power failure
Mode Switch		
RUN		Puts CPU into RUN mode
TERM		Allows peripherals (HPP, *Direct*SOFT) to select the mode of operation
STOP		Forces CPU out of RUN mode
Port 1		
Protocols		K-sequence slave, *Direct*NET™ slave, Modbus RTU slave
Devices		Can connect w/HPP, *Direct*SOFT, *C-more*, DV-1000, O/I panels, or any *Direct*NET master
Specs.		6P6C phone jack connector RS-232 9,600 baud Fixed address Odd parity only 8 data bits one start, one stop asynchronous, half-duplex, DTE
Port 2		
Protocols		K-sequence slave, *Direct*NET Master/Slave, Modbus RTU Master/Slave, ASCII OUT, Remote I/O Master
Devices		Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, DV-1000, other O/I panels, any *Direct*NET or Modbus RTU master or slave, or ASCII devices
Specs.		HD15 connector RS-232/422 300/600/1200/2400/4800 9600/19.2 K/38.4 Kbaud Odd, even, or no parity Selectable address (1-90, HEX 1 – 5A) 8 data bits, one start, one stop Asynchronous, Half-duplex, DTE
Battery (Optional)		
D2-BAT-1		Coin type, 3.0 V Lithium battery, 560 mA, battery number CR2354

Note: Batteries are not needed for program back-up. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage.



D2-230/240 Key Features

D2-240 CPU

D2-240 <--->

D2-240: for basic applications

The D2-240 provides a subset of the D2-250-1's capabilities. If you need a good CPU with multiple communications ports, and complex math or PID isn't required, then the D2-240 is the CPU for you!

Built-in memory

There is 2.5K of EEPROM program memory in the D2-240. No additional memory is required.

If you have critical data stored in the capacitor backed V-memory, simply purchase the optional lithium battery (D2-BAT) to permanently maintain these parameters as well.

Powerful instructions

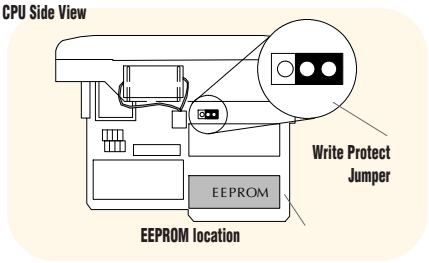
The D2-240 instructions cover most of the capability of our more powerful D2-250-1, and allow you to cover a wide variety of applications. Instructions include Boolean logic, data manipulation, integer math, interrupts, subroutines, FOR/NEXT loops, etc. For a complete list of instructions, see the back of this section.

Two built-in RS-232 communications ports

The D2-240 offers two communication ports. The top port can be used for a direct connection to a personal computer for programming, to our handheld programmer, *C-more*, or to the DV-1000. The bottom port is a slave-only port and supports our *Direct*NET™ or K-sequence protocol at speeds up to 19.2 Kbaud. If you're using an operator interface or if you plan on connecting the system to a network later on, then you can choose the D2-240. The D2-240 also supports the D2-DCM Data Communication Module and the H2-ECOM Ethernet Communication Modules.

DL205 spare EEPROM chips

There may be cases where you want to have a spare EEPROM chip available. For example, maybe you need to upgrade a customer's machine with your latest enhancements. You can purchase extra EEPROM chips (two per pack). These can be installed in the CPU (D2-230/D2-240 only) and programmed, or they can be programmed directly with the DL205 handheld programmer.



EEPROM	D2-EE-1	D2-EE-2
CPU	*D2-230*	*D2-240*
CPU Program Storage Capacity	2.0K	2.4K
Writing Cycle Life	10,000	10,000
Write Inhibit	CPU jumper	CPU jumper
Memory Clear Method	Electrical	Electrical

D2-230 CPU

D2-230 <--->

D2-230: our lowest price DL205 CPU

The D2-230 is our most economical CPU in the DL205 product family. If you are looking at the DL205 primarily because of the size, or for other reasons that don't require lots of CPU horsepower, then give the D2-230 a try.

Built-in EEPROM memory

There is 2.0K of EEPROM program memory in the D2-230. No additional memory is required.

If you have critical data stored in the capacitor-backed V-memory, simply purchase the optional lithium battery (D2-BAT) to permanently maintain these parameters as well.

One built-in communications port

The D2-230 has only one communication port. If you are considering any network connections in the future, you will need the D2-240, D2-250-1 or D2-260 CPU. The extra port may be worth the cost, especially during machine startup or troubleshooting sessions. The D2-230 does not support the Ethernet or Data Communications modules.

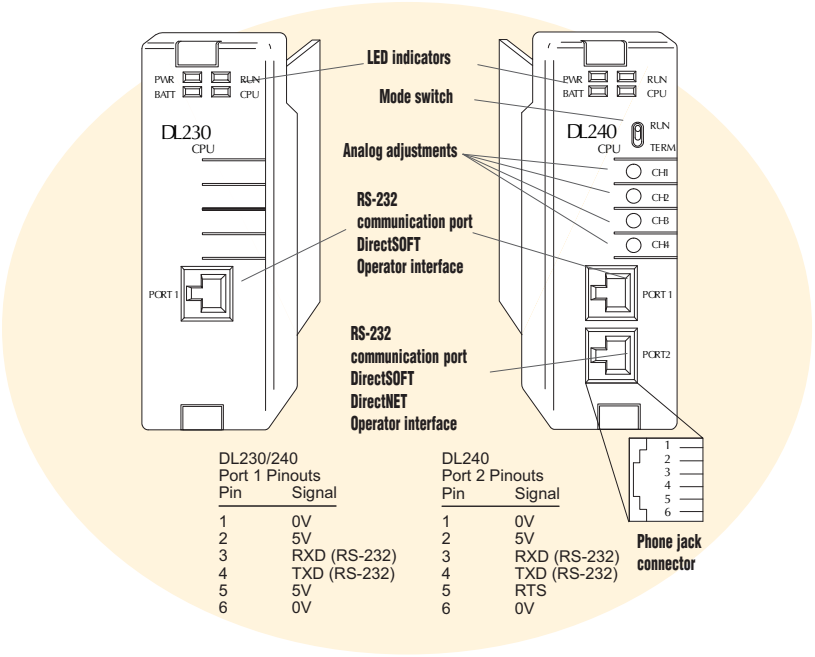
Basic instruction set

The D2-230 provides a subset of the D2-240's well-rounded instructions. The D2-230's instructions cover basic Boolean and simple integer math.

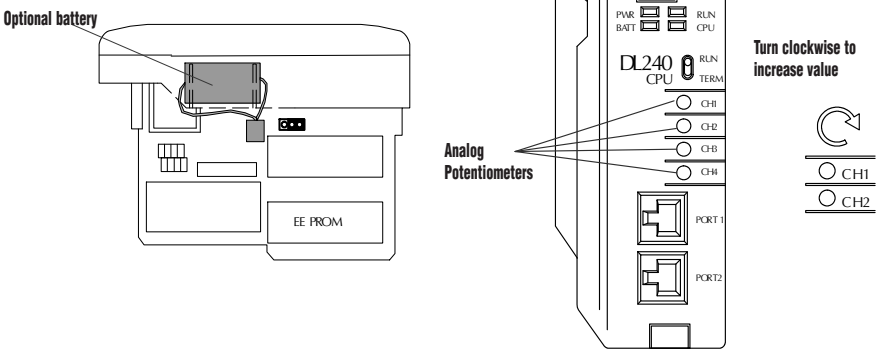
D2-230/240 Key Features

The diagram to the right shows the various hardware features found on the D2-230 and D2-240 CPUs.

CPU Status Indicators		
RUN	ON	CPU is in RUN mode
	OFF	CPU is in PROGRAM mode
BATT	ON	Battery backup voltage is low
	OFF	Battery backup voltage is OK or disabled
CPU	ON	CPU internal diagnostics detects error
	OFF	CPU is OK
PWR	ON	CPU power good
	OFF	CPU power failure
Mode Switch (D2-240 only)		
RUN		Puts CPU into RUN mode
TERM		Allows peripherals (HPP, *Direct*SOFT) to select the mode of operation
Port 1		
Protocols		K-sequence slave
Devices		Can connect w/HPP, *Direct*SOFT™, *C-more*, DV-1000
Specs.		6P6C phone jack connector RS-232 9,600 baud Fixed address Odd parity only 8 data bits, one start, one stop asynchronous, half-duplex, DTE
Port 2 (D2-240 only)		
Protocols		K-sequence slave, *Direct*NET slave
Devices		Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, DV-1000, or any *Direct*NET master
Specs.		6P6C phone jack connector 300/600/1200/2400/4800 9600/19.2k baud Odd or no parity Selectable address (1-90, HEX 1 – 5A) 8 data bits, one start, one stop Asynchronous, Half-duplex, DTE
Battery (Optional)		
D2-BAT		CR14250SE
Note: Batteries are not needed for program back-up. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage.		



CPU side view



Four external potentiometers for adjustments

There are four potentiometers on the face plate of the D2-240 CPU. They have a resolution of 256 steps and can be used to externally adjust four predefined V-memory locations inside the D2-240 CPU. You specify upper and lower limits for the values and the CPU takes care of the rest!

DL205 Programming Tools and Cables

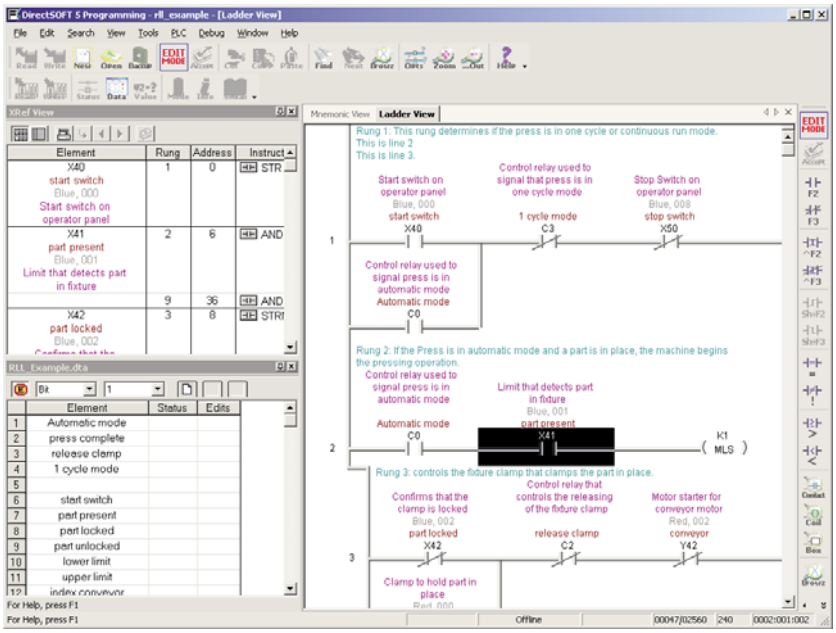
Selecting a programming device

There are two tools for programming the DL205 CPUs: *Direct*SOFT PC-based programming software and the D2-HPP handheld programmer.

*Direct*SOFT programming software

Our powerful Windows-based programming package makes it easy for you to program and monitor your DL205 PLC system. See the Software section in this catalog for detailed information on *Direct*SOFT.

*Direct*Soft Part Number	Description
PC-DSOFT5	Programs all *Direct*LOGIC PLC CPUs; offers *IBox* intelligent instructions
PC-DS100	Free version of *Direct*SOFT; programs all *Direct*LOGIC PLC CPUs; limited to 100 word program
Note: The D2-260 requires *Direct*SOFT version 4.0 or later	

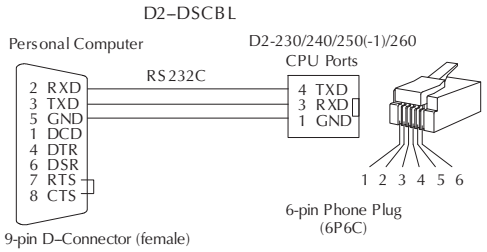

DirectSOFT 5 Programming - rll_example - [Ladder View]
Ladder View
Rung 1: This rung determines if the press is in one cycle or continuous run mode.
Rung 2: If the Press is in automatic mode and a part is in place, the machine begins the pressing operation.
Rung 3: controls the fixture clamp that clamps the part in place.

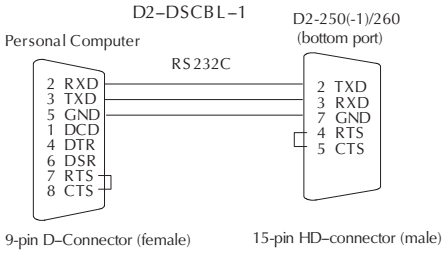
DL205 programming cables

Choose the proper cable to connect the DL205 CPU to your PC running *Direct*Soft.

CPU	Port	Cable
D2-230	Only one	D2-DSCBL
D2-240	Top port	D2-DSCBL
	Bottom port	D2-DSCBL
D2-250-1	Top port	D2-DSCBL
	Bottom port	D2-DSCBL-1
D2-260	Top port	D2-DSCBL
	Bottom port	D2-DSCBL-1

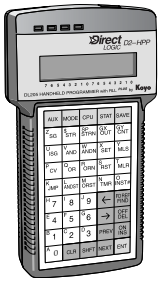
Pin labeling conforms to IBM DTE and DCE standards





Handheld programmer

The D2-HPP handheld programmer connects to an RJ12 phone jack port on any of the DL205 CPUs. The handheld unit contains a zero force insertion socket that can be used to store programs on an optional EEPROM. Can be used with DL05, DL06, DL105, DL205, and D3-350 models.



D2-HPP Handheld programmer, cable included (DV-1000CBL)

DL205 WinPLC: Windows® CE-based CPU

PC control with a WinPLC

The WinPLC provides a Windows® CE operating system environment in our DL205 CPU hardware. The small size and low cost of DL205 products is desirable, but the operating systems of the D2-230, 240, 250-1 and 260 CPUs are proprietary (like most PLCs). The WinPLC provides a hybrid PC-PLC solution that brings the best of the PLC and PC control worlds together. A WinPLC system is the best solution if your applications requires:

- Complex math
- Heavy serial communications (can use the H2-SERIO module)
- Advanced data manipulation
- Advanced handling of string or array data
- Up to 64 PID loops

Here's how it works

The WinPLC module is plugged into the CPU slot of the DL205 base. It uses Windows CE, a real-time operating system combined with the advantages of open standard software such as OPC, ActiveX and other Microsoft communications tools. The WinPLC offers both deterministic control and open communications. It uses advanced software development tools for control, data management, communication and integration with business systems. The WinPLC supports the following DL205 modules only:

- All discrete and analog modules
- Temperature input modules
- H2-SERIO serial communications module
- H2-ERM module for Ethernet remote I/O (limited to one ERM and one EBC slave per system)
- H2-CTRIO Counter I/O module

DL205 specialty modules not listed above are not supported by the WinPLC.

Specifications	H2-WPLC2-EN	H2-WPLC3-EN
Processor	Hitachi SH3 Series 7708 Processor	
Processor Speed	100 MHz	
Pre-loaded Software	Runtime engine compatible with Think & Do Studio or Think & Do Live!	
Memory	4MB FLASH EE ROM, 2MB RAM, 64kB battery-backed RAM10Mbps	8MB FLASH EE ROM, 8MB RAM, 64kB battery-backed RAM10Mbps
Indicators	Power, Link/Act, Run, Error	
Local I/O Points	256 (224 if using H2-ERM in module slot for Ethernet remote I/O)	
Ethernet Remote I/O points	256 (using H2-ERM master in local WinPLC base and H*-EBC or T1H-EBC remote slave	
Port 0	RJ12, 6-pin modular, serial port, supports K-sequence, or any protocol from Windows CE	
Port 1	RJ45, 8-pin modular, Ethernet 10MBPS	
I/O Interface	Backplane to DL205 (Up to 9-Slot base), expandable with H2-ERM	
Power Consumption	680 mA at 5VDC	
Weight	6 oz.	
Operating Temperature	0–60°C	
Storage Temperature	-20-70°C	
Agency Listings	UL Listing	
Manufacturer	Host Automation Products, LLC.	

Built-in Ethernet port

The WinPLC is programmed via a built-in 10 MB Ethernet port. WinPLCs can use OPC or DDE to link to an HMI or other application using this high-speed port; or, share tags with any controller running Think & Do software for coordinated control with a PC system. The built-in Ethernet port can also be used for peer-to-peer communications between multiple WinPLCs.

Built-in serial port

A built-in RS-232 serial port lets you connect a C-more or other operator interfaces to the WinPLC. You can also connect to devices such as barcode readers, weight scales or serial modems to the serial port. Unlike most RLL programming, the Think & Do programming method is designed for easy communication programming and string manipulation. Up to nine additional serial ports can be added to a WinPLC system by using the H2-SERIO serial communication module. For more information on the H2-SERIO module see "Additional Serial Ports for the WinPLC" later in this section.

Programming the WinPLC

Creating flowcharts (projects) for the WinPLC requires one of the following development packages running on a PC equipped with an Ethernet card: Think & Do Live! (PC-ENT-LIVE), the low-cost T&D Live! for WinPLC programming pack (PC-WPLC-LIVE), or Think & Do Studio (PC-ENT-SDD). Since each WinPLC includes its own run-time license, you can program as many WinPLCs as you need, at no additional cost. When you compile your project, the PC automatically downloads the flowcharts into the WinPLC. Then at runtime (or at power-up), the WinPLC will run the flowchart program.

CE-only version WinPLC

This version of the WinPLC is not preconfigured with any control software. It's for qualified OEMs or software developers who want to develop their control code in VB or C++. AUTOMATIONDIRECT does not sell this version of the WinPLC. If you are interested in the CE-only version, visit www.hosteng.com for details.

See the Think & Do PC Control software section in this catalog for information on the PC-WPLC-START Starter Kit, and the PC-WPLC-LIVE Think & Do Live! WinPLC programming package.

DL205 CPU-Slot Slave Controllers

Overview

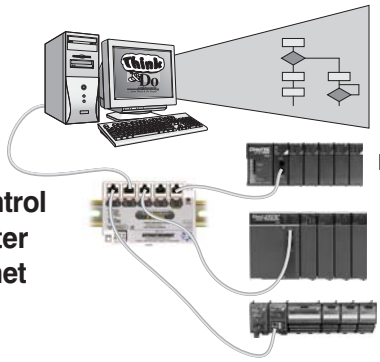
There are currently four slave "base controllers" or "slave I/O controllers" available for the DL205 hardware. This allows you to use industry proven DL205 I/O for general purpose distributed applications.

The controller modules are plugged into the CPU slot of any size DL205 base. The slave controllers must be connected to a network master controller module or to a PC running PC-based control, HMI or SCADA software.

H2-EBC

Ethernet Base Controller Module

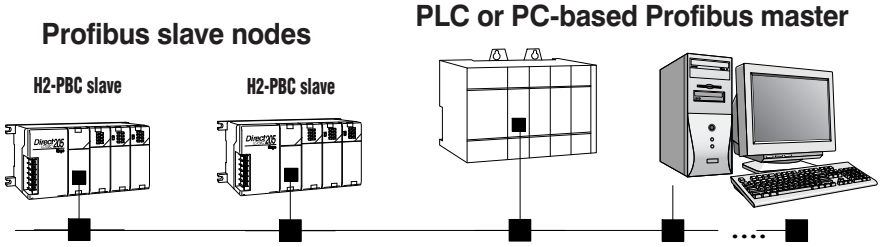
See page 4–52



H2-PBC

Profibus DP Slave Base Controller Module

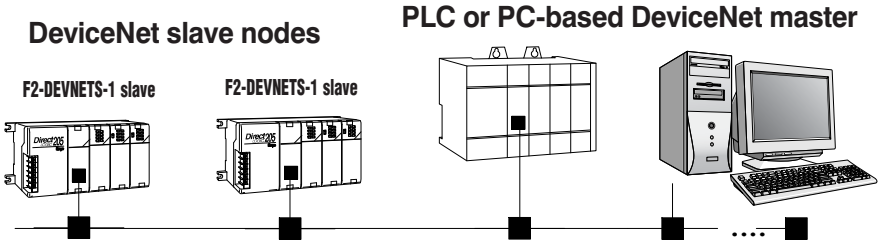
See page 4–60



F2-DEVNETS-1

DeviceNet Slave Module

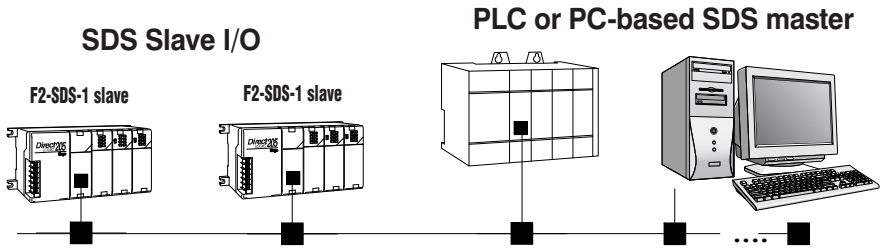
See page 4–62



F2-SDS-1

Smart Distributed System I/O

See page 4–64



Step 3: Additional Communications Ports Needed?

Do you need communications ports in addition to the built-in CPU communications ports to connect to an operator interface or HMI? Would you like to connect to a network of other AUTOMATIONDIRECT products, or a Modbus RTU or Ethernet network? If so, then choose between the H2-ECOM(100) Ethernet communications module or the D2-DCM serial data communications module. Both modules' specifications and communications details are covered later in this section.

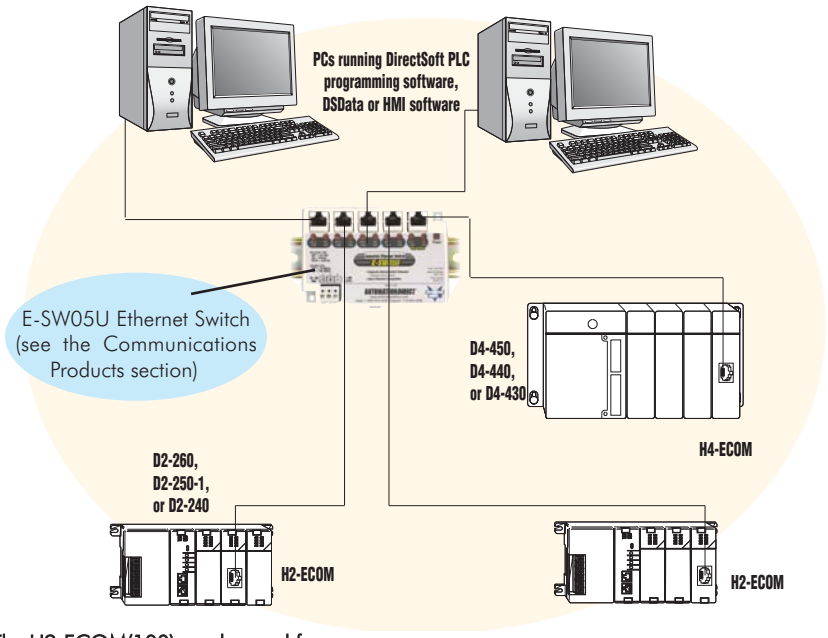
Ethernet networking with the H2-ECOM(100)

The D2-260, D2-250-1 and D2-240 CPUs support the H2-ECOM(100) Ethernet communications module. Any PLC on an ECOM network can initiate communications with another PLC or use *Direct*SOFT to program any PLC on the network. This is the fastest data transfer rate we offer for HMI or other Windows-based software. When monitoring your PLC, you will notice much faster updates using the ECOM module. The H2-ECOM(100) module supports the industry standard 10Base-T with an RJ45 port. The H2-ECOM-F has ST-style bayonet connectors for 10Base-FL fiber optic connections. The ECOM modules use standard cables, hubs and repeaters which are available from a large number of suppliers. A virtually unlimited number of PLCs can be connected to an Ethernet network using ECOM modules.

Serial networking with the D2-DCM

The D2-260, D2-250-1, and D2-240 CPUs support the D2-DCM Data Communications Module, which can serve as a *Direct*Net master/slave, *Direct*Net peer, or a Modbus RTU slave. The D2-DCM supports both RS-232 and RS-422. You can program the CPU through the DCM locally, or if a PC is the RS-422 master, you can use *Direct*SOFT to program any PLC on the network.

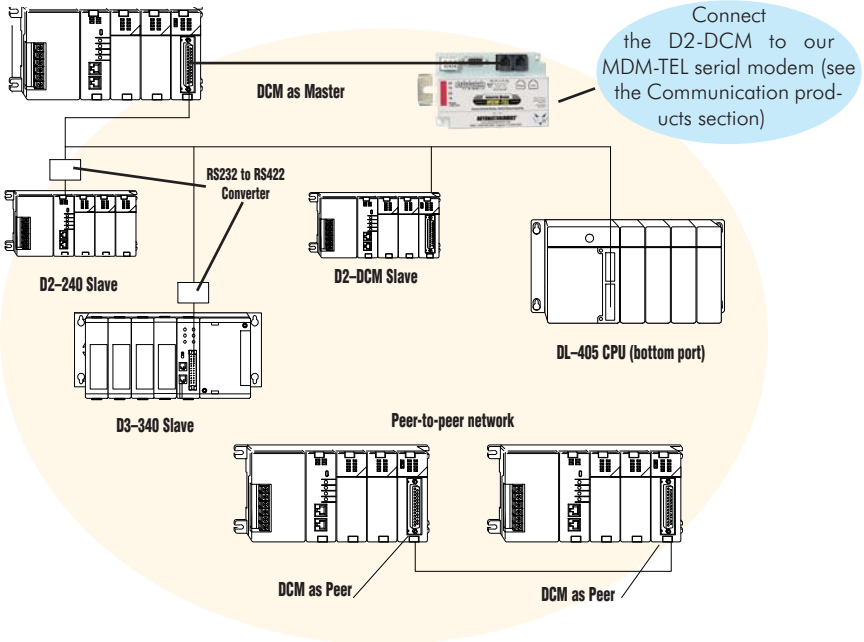
H2-ECOM100 Ethernet network


PCs running DirectSoft PLC programming software, DSData or HMI software
E-SW05U Ethernet Switch (see the Communications Products section)
D4-450, D4-440, or D4-430
H4-ECOM
D2-260, D2-250-1, or D2-240
H2-ECOM
H2-ECOM

The H2-ECOM(100) can be used for:

- High-speed peer-to-peer networking of PLCs (any PLC can initiate communications)
- CPU programming with ***Direct***SOFT Programming Software
- High-speed data acquisition via HMI, DSData Server, Lookout***Direct*** or other HMI software
- Virtually unlimited number of network nodes
- Very easy to setup

D2-DCM serial network



The D2-DCM can be used for:

- ***Direct***Net networking of PLCs (only one DCM or PC can serve as master)
- Peer-to-peer networking of two DCM modules (each can serve as a master or slave)
- CPU programming with ***Direct***SOFT Programming Software
- Data acquisition via HMI, DSData Server, Lookout***Direct*** or other HMI software
- A slave on a Modbus RTU network
- Connection to a serial modem (MDM-TEL)

Additional Serial Ports for the WinPLC

H2-SERIO serial communications module for the WinPLC

Do you need serial communications ports in addition to the built-in serial port on the WinPLC? Do you need to connect to multiple *C-more* or other operator interface panels? Would you like to connect devices such as barcode readers, weight scales or serial modems to your WinPLC system? If so, then select the H2-SERIO serial communications module. This module is used exclusively with the WinPLC.

Protocols supported

The H2-SERIO module supports serial ASCII communications and can also serve as a Modbus RTU slave.

Up to ten serial ports

The WinPLC has one built-in serial port. Each H2-SERIO module has three serial ports on board. Up to three H2-SERIO modules can be used per WinPLC system. That's a total of ten serial ports that can be used in one WinPLC system to handle all of your serial communications needs.

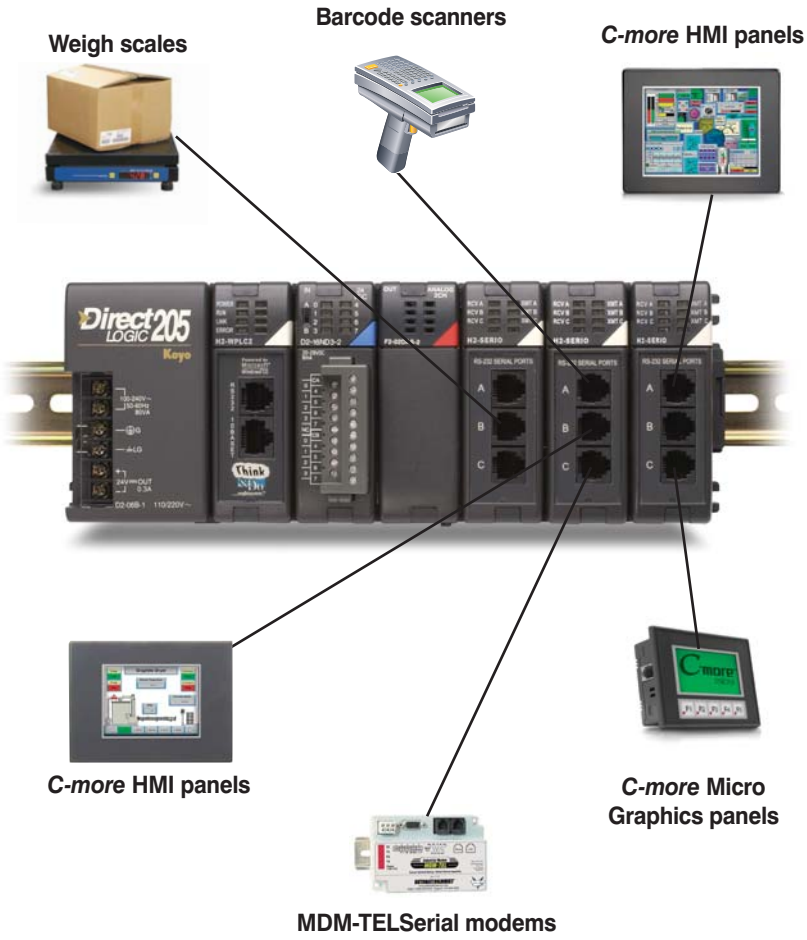
Separate communication parameters for each port

Use Think & Do software packages to set baud rate, parity, data bits, and stop bits for each serial port. Choose from 300 to 57.6 Kbaud communication speeds. Think & Do Studio or Think & Do Live! allows each port to be designated as a Modbus slave or a generic serial device. Each port on the H2–SERIO module is capable of full hardware handshaking.

Note on processing large amounts of serial data

While the H2-SERIO module will support virtually any serial device, processing large amounts of serial data will increase the system response time. This is important to consider when using multiple H2-SERIO modules, especially in a WinPLC local base with an H2-ERM or H2-CTRIO module.

Connect the WinPLC / H2-SERIO system to a variety of serial or ASCII devices.



Step 4: Select the I/O Modules

There are several factors you should consider when choosing an I/O module.

1. Environmental specifications: What environmental conditions will the I/O module be subjected to?

2. Hardware specifications: Does this product have the right features, performance and capacity to adequately serve your application?

3. Field termination: How does this module connect to field devices? Do you need a sinking or sourcing DC module?

4. Power budget: It is very important that your module selections operate within the base power budget. Refer to the power budget description later in this section.

Check the environmental specifications

The following table lists the environmental specifications that globally apply to the DL205 system (CPUs, bases, and I/O modules). Be sure the modules you choose are operated within these environmental specifications.

Specifications and ratings

Storage temperature*
-4ºF – 158ºF (-20ºC to 70ºC)
Ambient operating temperature**
32ºF – 131ºF (0º to 55ºC)
Ambient humidity
30% - 95% relative humidity (non-condensing)
Vibration resistance
MIL STD 810C, Method 514.2
Shock resistance
MIL STD 810C, Method 516.2
Noise immunity
NEMA (ICS3-304)
Atmosphere
No corrosive gases

**** Storage temperature for the Handheld Programmer is –4º to 158ºF (-20º to 70ºC)***

Storage temperature for the DV-1000 is –4º to 158ºF (-20º to 70ºC)

***** Operating temperature for the Handheld Programmer is 32º to 122ºF (0º to 50ºC)***

Operating temperature for the DV-1000 is 32º to 122ºF (0º to 50ºC)

This logo is placed by each I/O module that supports *ZIP*Link connection systems. (The I/O modules are listed at the end of this section.) See the Terminal Blocks and Wiring section for details on *ZIP*Links.

Review I/O hardware specifications

The hardware specifications for every DL205 module are described later in this section.

Take time to understand the specification charts, the derating curves and the wiring diagrams. The module specifications should help you determine if this module is right for your application.

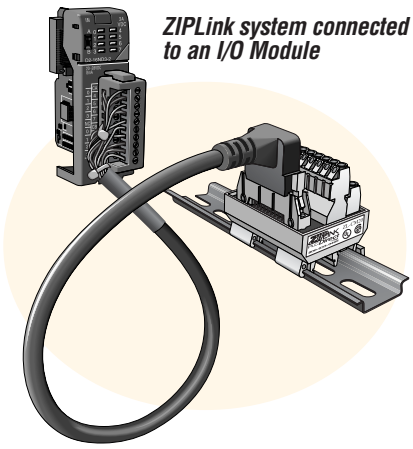
Factors affecting field termination

DL205 modules use three types of field terminations. They include a low density removable terminal block (used on modules with eight or fewer points), a high density removable terminal block (European style terminal block available on modules with 12 to 16 points), and a 40-pin connector (for modules with 32 points). The module diagrams indicate the connector type that is on the module. You can also use our super fast and inexpensive *ZIP*Link I/O connector systems.

Module types and suggested AWG range

4 point
16* - 24 AWG
8 point
16* - 24 AWG
12 point
16* - 24 AWG
16 point
16* - 24 AWG
32 point
Ribbon and Solder-style Connectors

**** Note: 16 AWG Type TFFN or Type MTW can be used on 8 pt. modules. Other types of 16 AWG may be acceptable, but it really depends on the thickness of the wire insulation. If the insulation is too thick and you use all the I/O points, then the plastic terminal cover may not close properly.***



***ZIP*Link system connected to an I/O Module**

Need spare parts?

Sometimes it is helpful to have extra I/O module connectors or spare fuses. The DL205 spare parts and accessories are listed below:

- D2-FILL – Filler module for empty slots
- D2-8IOCON – 8-pt. I/O terminal blocks
- D2-16IOCON – 16-pt. I/O terminal blocks
- D2-IOCVR – Spare terminal block covers
- D2-FUSE-1 – Fuses for D2-12TA
- D2-FUSE-3 – Fuses for D2-04TD1, D2-08TA, D2-04TRS, D2-08TR, D2-08CDR
- D2-FUSE-4 – Fuses for D2-12TR
- D2-ACC-1 – Base power terminal strip screws
- D2-ACC-2 – Spare terminal screws for 4-pt. and 8-pt. I/O modules
- D2-ACC-3 –Spare terminal screws for 12-pt. and 16-pt. I/O modules
- D4-IO3264R – Ribbon cable connector for 32-pt. modules.
- D4-IO3264S – Solder-type connector for 32-pt. modules.
- **DIN***nectors* and ***ZIP***Links — Refer to the Terminal Blocks and Wiring section of this catalog for the complete line of products available.

DIN*nectors* terminal blocks

DIN*nectors* are DIN-rail mounted connectors or terminal blocks. They provide a means of connecting and identifying two or more wires. All **DIN***nectors* are UL, CSA, VDE, SEV, RINA and IEC approved. For more information, refer to the Terminal Blocks and Wiring section.

*ZIP*Link connection systems

*ZIP*Links consist of PLC interface cables and connector modules that offer "plug and play" capability by plugging one end of the *ZIP*Link cable into an I/O module and the other end into the *ZIP*Link connector module. This eliminates the tedious process of wiring PLC I/O terminals to terminal blocks individually. For more information, refer to the Terminal Blocks and Wiring section to determine compatibility among PLCs, cables and I/O modules.

I/O Availability

I/O Availability Table										
PLC CPU / CPU-Slot Controller		*D2-230*	*D2-240*	*D2-250-1*	*D2-260*	*WinPLC*	*Profibus*	*H2-EBC*	*F2-SDS-1*	*F2-DEVNETS-1*
Discrete Modules	*Catalog Pages*	4-31	4-31	4-29	4-26	4-34	4-60	4-52	4-64	4-62
DC Sink/Source In	4-78	√	√	√	√	√	√	√	√(except 32-pt.)	√
DC Output	4-83	√	√	√	√	√	√	√	√(except 32-pt.)	√
AC Input	4-80	√	√	√	√	√	√	√	√	√
AC Output	4-88	√	√	√	√	√	√	√	√	√
Relay Out	4-90	√	√	√	√	√	√	√	√	√
DC In / Relay Out	4-95	√	√	√	√	√	√	√	√	√
Analog Modules										
Analog Current In	4-96	√	√	√	√	√	√	√	√	√
Analog Voltage In	4-99	√	√	√	√	√	√	√	√	√
Analog Current Out	4-104	√	√	√	√	√	√	√	√	√
Analog Voltage Out	4-108	√	√	√	√	√	√	√	√	√
Analog Isolated Current Out	4-106	√	√	√	√	√	√	√	√	√
Analog Isolated Voltage Out	4-110	√	√	√	√	√	√	√	√	√
Combination Analog	4-112	√	√	√	√	√	√	√	√	√
Temperature Input	4-102	√	√	√	√	√	√	√	√	√
Speciality Modules										
Local Expansion	4-48			√	√					
Communications	4-56		√	√	√					
Remote I/O	4-55		√	√	√	√(H2-ERM)				
CoProcessor	4-66		√	√	√					
Counter I/O (CTRIO)	4-68		√	√	√	√		√		
Counter Interface	4-76	√	√	√	√					

Sinking and sourcing for DC field devices

If you are using a DC type of field device, then you should consider whether the device is a sinking or sourcing configuration. This may affect your module selection since it determines the manner in which the device must be wired to the module (AUTOMATIONDIRECT *offers both sinking and sourcing modules*). Refer to the sinking/sourcing appendix for a complete explanation on how this affects your system selection.

Analog module selection tips

If you're going to control the speed of an AC inverter or drive with the DL205 analog module, make sure you select either the current sourcing F2-02DAS-1 or voltage sourcing F2-02DAS-2 isolated analog output module. Complete module specifications are listed later in this section.

If you need to operate within a 12 VDC environment, the analog module part numbers that end with (-L) will operate at 12 VDC. Most of the other modules require 24 VDC.

H2-CTRIO vs. D2-CTRINT high-speed counter module

Select the H2-CTRIO instead of the D2-CTRINT if your application requires:

- More than one quadrature encoder
- More than two single up counters
- Compatibility with the WinPLC
- High-speed inputs or outputs > 5 kHz
- Output operations on the module based on counts without interacting with the CPU

The CTRIO is configured using "CTRIO Workbench", a Windows-based "Wizard" utility, eliminating the need for ladder logic programming to configure the module. Multiple CTRIO modules can be used in a base to support additional input/output pulse trains.

Step 5: Choose an I/O Configuration

I/O configurations

The DL205 system offers local, local expansion and remote I/O system configurations. A DL205 system can use a combination of the configuration arrangements. The tables, along with the configuration diagrams, list the number of I/O points, bases, etc. that are available with each configuration.

I/O bases

I/O bases are used in local, local expansion or remote I/O configurations. The (-1) bases are required for local I/O expansion that is supported only by the D2-250-1 and D2-260 CPUs. The (-1) bases can be used with all DL205 CPUs and the WinPLC. (Older, non-(-1) bases can be used if local expansion is not required.) There are four DL205 base sizes (3, 4, 6, and 9-slot), each of which has a built-in power supply.

Local I/O

All of the DL205 CPUs support local I/O. The D2-230 and D2-240 CPUs are limited to one base of local I/O. (The D2-250-1 and the D2-260 CPUs support local expansion bases). All local I/O points are updated on every CPU scan. The I/O count limits are determined by the number of available I/O slots, the I/O module point density, and the power budget available for the system.

Local expansion

The D2-260 supports local expansion up to five total bases (one CPU base and four expansion bases) and the D2-250-1 supports local expansion up to three total bases (one CPU base and two expansion bases). The D2-230/240 CPUs and WinPLCs do not support local expansion I/O. Expansion bases are commonly used when there are not enough slots available in the CPU base, or when the base power budget will be exceeded. Each local expansion base requires the D2-CM module in the CPU slot. The local CPU base requires the D2-EM Expansion Module, as well as each expansion base. The modules are connected using the D2-EXCBL-1. When using expansion bases, discrete I/O are updated synchronously with each scan, while analog I/O are asynchronous with the scan.

Ethernet remote I/O

The DL205 Ethernet Remote I/O system allows you to locate I/O bases at a remote distance from the CPU. For many applications, this can reduce wiring costs by allowing I/O points to be located near the devices they are controlling.

The Ethernet Remote Master module (H2-ERM) is placed in an I/O slot of the local CPU base. Ethernet Base Controller (EBC) modules serve as the remote slave units and are placed in the CPU slot of one or more remote bases. You can use standard DL205 modules in the remote bases. The Remote Slaves are connected to the Master using Category 5 UTP cables for cable runs up to 100 meters. Use repeaters to extend distances and hubs to expand the number of nodes. Our fiber optic version uses industry standard 62.5/125 ST-style fiber optic cables and can be run up to 2,000 meters.

Each H2-ERM module can support up to: 16 H2-EBC systems, 16 Terminator I/O EBC systems, 16 fully expanded H4-EBC systems, or any combination of these.

The PLC, ERM and EBC slave modules work together to update the remote I/O points. These three scan cycles are occurring at the same time, but asynchronously. It is recommended that critical I/O points that must be monitored every scan be placed in the CPU base.

ERM Workbench is an easy-to-use Windows-based software utility for configuring the ERM and its remote slaves.

It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its slaves. While Ethernet networks can handle a very large number of data transactions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the I/O network. Ensure ERM networks, multiple ERM networks and ECOM/office networks are isolated from one another.

Serial remote I/O

The DL205 Serial Remote I/O system also allows you to locate I/O bases at a remote distance from the CPU.

The Remote Master module (D2-RMSM) is placed in an I/O slot of the local CPU base. The Remote Slave module (D2-RSSS) is placed in the CPU slot of one or more remote bases. You can use standard DL205 modules in the remote bases. The Remote Slaves are connected to the Master module in a daisy-chain manner over a twisted pair communication cable. You can assign input and output addresses to the remote I/O points by using setup logic in your RLL program. The Remote Master polls the slaves and sends the remote I/O information to the CPU. The communication between the Remote Master and the CPU is asynchronous to the CPU scan. For this reason, Remote I/O applications should be limited to those that do not require the Remote I/O points to be updated with every scan.

The number of bases supported depends on your choice of Remote I/O communications protocol, Remote Master (RM-NET) or Slice Master (SM-NET). In SM-NET mode, the communications port on the D2-RSSS remote slave can be used to connect to an operator interface or to program/monitor the CPU with *Direct*SOFT; however the communication will not be as fast as using a CPU port.

Remote master protocol (RM-NET)– allows you to connect up to seven remote bases to a single master. The baud rate is fixed at 38.4 Kbaud with a total allowable distance of 3,900 feet.

Slice master protocol (SM-NET)– allows you to connect up to 31 remote bases to a single master. The baud rate is selectable over several ranges with a maximum baud rate of 614.4 Kbaud.

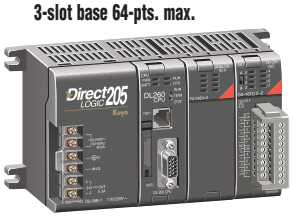
Local and Local Expansion I/O Configurations

Local I/O configurations

Local I/O Configuration			
CPU	*Total I/O*	*Max. Inputs*	*Max. Outputs*
D2-230	128	128	128
D2-240	256	256	256
D2-250-1	256	256	256
D2-260	256	256	256

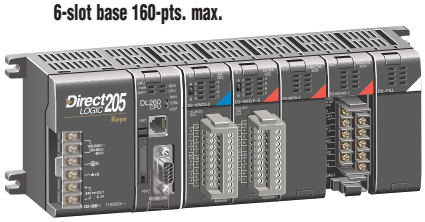
Four I/O base configurations to select from

3-slot base 64-pts. max.

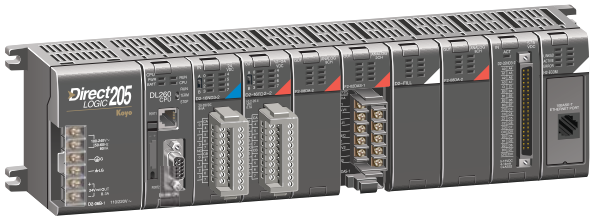


4-slot base 96-pts. max.

6-slot base 160-pts. max.



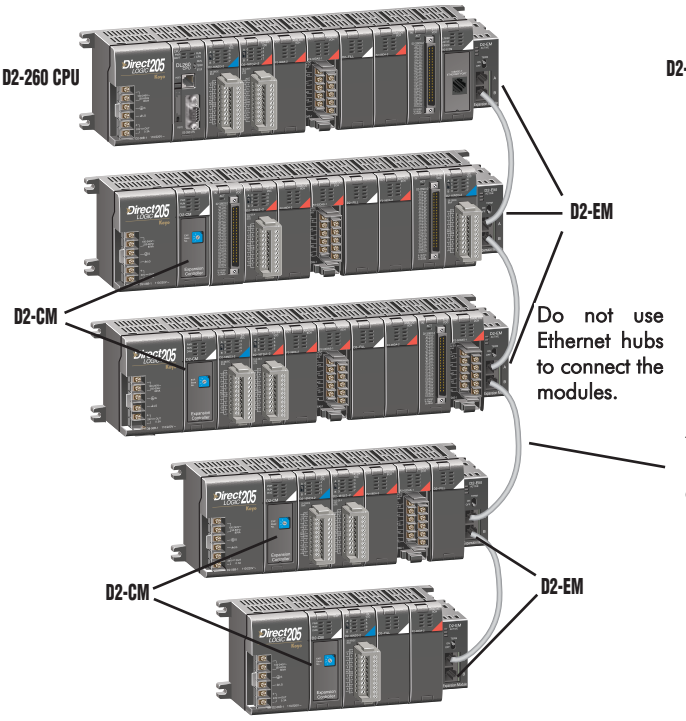
9-slot base 256-pts. max.



Local expansion I/O configurations using D2-EM and D2-CM modules

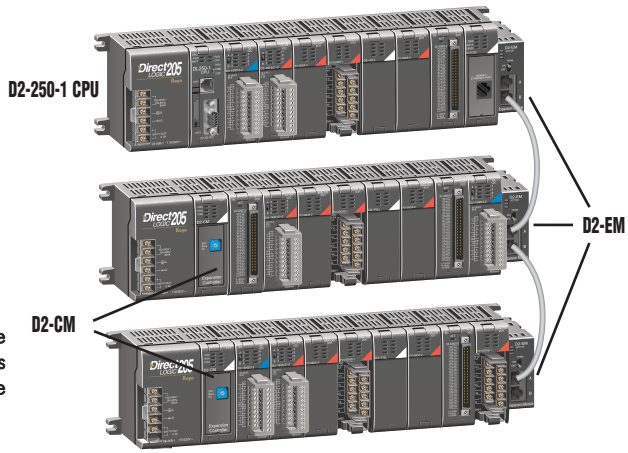
D2-260 local expansion system

The D2-260 supports local expansion up to five total bases (one CPU base and four expansion bases). All bases in an expansion system must be (-1) bases. The CPU base can be located at any point in the expansion system layout. The maximum total expansion system cable length is 30m (98 ft.). For more information, refer to the Expansion Module specification pages later in this section.



D2-250-1 local expansion system

The D2-250-1 supports local expansion up to three total bases (one CPU base and two expansion bases). The CPU base can be located at any point in the expansion system layout. The maximum total expansion system cable length is 30m (98 ft.).



The D2-EXCBL-1 is a Category 5 straight-through cable that connects the D2-EM modules together. The cable can be user made in custom lengths up to 30m depending upon the configuration.

Local Expansion I/O Configuration				
CPU	*# of Exp. Bases*	*Total I/O*	*Max. Inputs*	*Max. Outputs*
D2-250-1	2	768	512	512
D2-260	4	1280	1024	1024

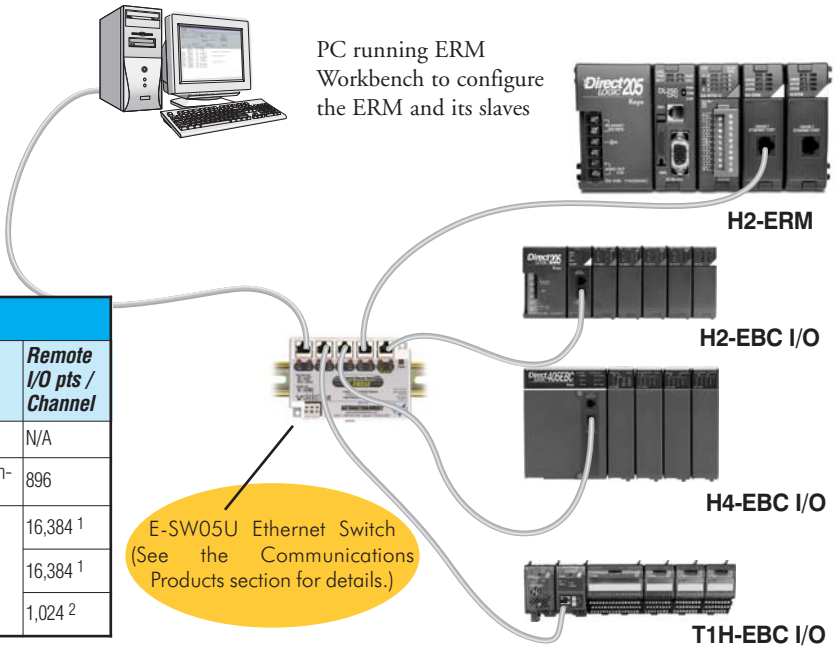
DL-230, DL240 CPUs and WinPLCs do not support local expansion systems

Remote I/O Configurations

Ethernet remote I/O configuration using H2-ERM and EBC slaves

Specifications	H2-ERM	H2-ERM-F
Communications	10Base-T Ethernet	10Base-FL Ethernet
Data Transfer Rate	10Mbps	
Link Distance	100 meters (328 ft)	2Km (6560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	

Ethernet Remote I/O Configuration					
CPU	*Max. # of Channels*	*Max. # of Slaves/ Channel*	*Discrete I/O pts.*	*Analog I/O*	*Remote I/O pts / Channel*
D2-230	N/A	N/A	N/A	N/A	N/A
D2-240	Limited by power budget	16 Slaves (H2-EBC, H4-EBC or T1H-EBC)	limited to 896 by CPU	Not recommended	896
D2-250-1			2048	Map into available memory registers	16,384 [1]
D2-260			8192		16,384 [1]
H2-WPLC-***	1 / system	1 Slave	256		1,024 [2]

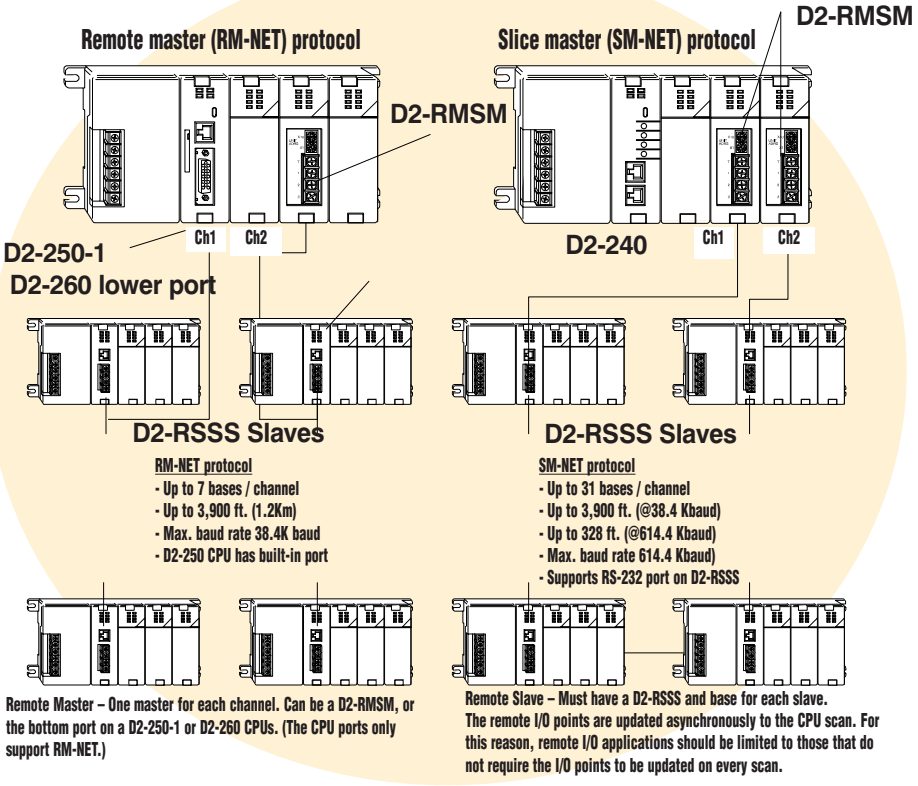

PC running ERM Workbench to configure the ERM and its slaves
H2-ERM
H2-EBC I/O
H4-EBC I/O
T1H-EBC I/O
E-SW05U Ethernet Switch (See the Communications Products section for details.)

[1] 16,384 I/O pts. can be achieved with 16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions.
[2] 1024 I/O points can be achieved using 1 fully expanded H4-EBC slave.

Note: It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its slaves. While Ethernet networks can handle a very large number of data transactions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the I/O network. Ensure ERM networks, multiple ERM networks and ECOM/office networks are isolated from one another.

Serial remote I/O configuration using D2-RMSM and D2-RSSS

Serial Remote I/O Configuration			
CPU	*D2-240*	*D2-250-1*	*D2-260*
Max. # of Channels	2	7	7
Max. I/O pts. per Channel	896 (limited by CPU)	2,048	2,048
RM-NET[1] Bases per Channel	7	7	7
SM-NET[1] Bases per Channel	31	31	31
Total Remote I/O pts.	896 (limited by CPU)	2,048	8,192


Remote master (RM-NET) protocol
Slice master (SM-NET) protocol
D2-RMSM
D2-RMSM
D2-250-1
D2-260 lower port
D2-240
Ch1
Ch2
Ch1
Ch2
D2-RSSS Slaves
D2-RSSS Slaves
RM-NET protocol
- Up to 7 bases / channel
- Up to 3,900 ft. (1.2Km)
- Max. baud rate 38.4K baud
- D2-250 CPU has built-in port
SM-NET protocol
- Up to 31 bases / channel
- Up to 3,900 ft. (@38.4 Kbaud)
- Up to 328 ft. (@614.4 Kbaud)
- Max. baud rate 614.4 Kbaud)
- Supports RS-232 port on D2-RSSS
Remote Master – One master for each channel. Can be a D2-RMSM, or the bottom port on a D2-250-1 or D2-260 CPUs. (The CPU ports only support RM-NET.)
Remote Slave – Must have a D2-RSSS and base for each slave. The remote I/O points are updated asynchronously to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the I/O points to be updated on every scan.

I/O Addressing Schemes

DL205 I/O addressing scheme

You may have used other PLC systems prior to trying *Direct*LOGIC products. One of the key differences between various PLC systems is the I/O module addressing. This section will show you how we address the individual I/O points in a DL205 system.

Octal addressing

The DL205 uses octal addressing. That is, the I/O point addresses do not include any "8s" or "9s". The I/O points start at 0 and continue in increments of 8 or 16 points, depending on the modules being used. We have designated "X" for inputs and "Y" for outputs.

Note: Four-point modules consume eight points, but only the first four points are actually used by the module. Twelve-point modules consume 16 points, but only 12 points are used. The first six points are used, then two points are skipped, then the next six points are used, and the last two are skipped.

Automatic addressing

The DL205 CPUs automatically examine local I/O modules to establish the correct I/O addressing on power-up. The D2-250-1 and D2-260 CPUs automatically examine I/O modules in expansion bases as well. The modules don't have to be grouped by type and can typically be mixed in any order. However, there are restrictions placed on some specialty modules or combinations of modules (see the next page). The diagram to the right shows sample addresses for a simple system that contains a few discrete I/O modules.

Manual addressing

The D2-250-1 and D2-260 CPUs allow you to manually assign I/O addresses for any or all I/O slots on the local or expansion bases. This feature is useful if you have a standard configuration that you need to change slightly to accommodate a special request (i.e. adding or removing I/O modules from a system). Manual addresses are based on 16-point boundaries.

Remote I/O addressing

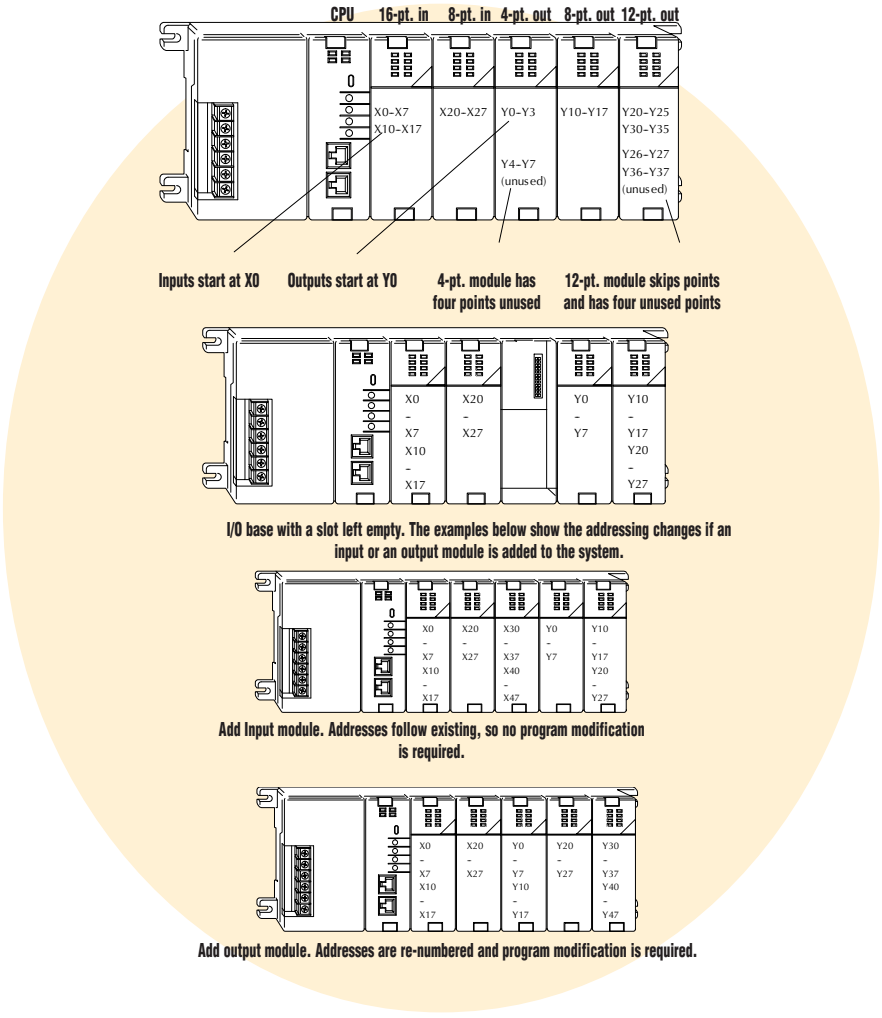
Remote I/O allows you to assign addresses manually. You can choose the data type for the remote points. Ethernet remote I/O (H2-ERM) allows you to map the analog I/O channels directly into V-memory (16-bit words) while mapping the discrete I/O points into input/output bit memory (Xs & Ys). Serial remote I/O (D2-RMSM) allows you to assign one starting address for all of the input modules and one starting address for the output modules.

Leaving empty slots

You may be tempted to leave empty slots for future expansion. This is perfectly acceptable, but it is very important that you understand the implications of placing a module in the empty slot at a later time.

Since the CPU automatically assigns the I/O addresses, it is possible to cause problems by adding a module to the system. Examine the example system shown below. If you added an input module to the empty slot, the new input addresses would start after the existing input addresses, so no problems would occur. However, if you added an output to the empty slot, your remaining output addresses would change. Therefore, you would have to edit your RLL program to reflect the address changes. The manual addressing feature supported by the D2-250-1 and D2-260 is especially useful when adding an I/O module between existing I/O modules or removing a module.

You should always add extra modules to the right of existing modules of the same type to avoid any re-addressing of your I/O points.



Module Placement and I/O Usage Tables

Verify planned I/O module locations

There are very few I/O module placement restrictions in the DL205 family. In general, any mix of analog and discrete module types can be used in any local, expansion or remote base. However, there are a few situations with the analog and specialty modules that warrant some special considerations. Reference the Module Placement Restrictions table to the right for the DL205.

Analog I/O with a D2-230 CPU

DL205 analog modules map into the CPU as 16-point discrete modules. (They actually consume discrete I/O points.) With a D2-240, D2-250(-1) or D2-260 CPU, analog I/O modules can reside in any I/O slot. If you are using a D2-230 CPU, then the analog module must start on one of the word addresses boundaries. (You may have to rearrange your modules to ensure this happens.)

Analog I/O with expansion bases

When using an analog module in an expansion base, the analog update time to the CPU will be asynchronous to the scan time.

I/O point usage

The table to the right indicates the number of I/O points consumed by each module. Use this information to ensure you stay within the maximum I/O count of the I/O system you have chosen.

Module Placement Restrictions

Module/Unit	Local CPU Base	Local Expansion	Remote Base
CPUs	CPU slot only		
DC Input	✓	✓	✓
AC Input	✓	✓	✓
DC Output	✓	✓	✓
AC Output	✓	✓	✓
Relay Output	✓	✓	✓
Analog Input & Output[1]	✓	✓	✓
Local Expansion[2] (D2-260 & D2-250-1 only)			
Base Expansion Unit (D2-EM)	✓	✓	
Base Controller Unit (D2-CM)		CPU slot only	
Remote I/O			
Remote Master	✓		
Remote Slave Unit			CPU slot only
Ethernet Remote Master	✓		
CPU Device			
Ethernet Base Controller	CPU slot only		
WinPLC	CPU slot only		
DeviceNET	CPU slot only		
Profibus	CPU slot only		
SDS	CPU slot only		
Specialty modules			
Counter Interface (D2-CTRINT)	Slot 0 only		
Counter I/O (H2-CTRIO)[3]	Any slot except Slot 0		
Simulator	✓	✓	✓
Data Communications	Any slot except Slot 0		
Ethernet Communications	Any slot except Slot 0		
Basic CoProcessor	Any slot except Slot 0		

[1] With a D2-230 CPU, the analog module must start on one of the word address boundaries.
[2] When used in expansion bases, the analog update is asynchronous to the PLC.
[3] H2-CTRIO will not work in slot 0 when used with the DL-240, DL-250-1, DL-260. The H2-CTRIO is not supported in expansion bases at this time. The H2-CTRIO will work in slot 0 if used with one of the H2-WPLC units.

I/O Module Point Usage

DC INPUT		RELAY OUTPUT		SPECIALTY MODULES	
D2-08ND3	8 in	D2-04TRS	8* out	D2-EX	None
D2-16ND3-2	16 in	D2-08TR	8 out	D2-CM	None
D2-32ND3	32 in	F2-08TR	8 out	F2-08SIM	8 in
D2-32ND3-2	32 in	F2-08TRS	8 out	D2-CTRINT	8 in 8 out
		D2-12TR	16** out	H2-CTRIO	None
AC INPUT				D2-DCM	None
D2-08NA-1	8 in	**COMBINATION**		F2-DEVNETS-1	None
D2-08NA-2	8 in	D2-08CDR	8 in*/8 out*	F2-SDS-1	None
D2-16NA	16 in			H2-EBC	None
DC OUTPUT		**ANALOG**		H2-EBC-F	None
D2-04TD1	8* out	F2-04AD-1 & 1L	16 in	H2-ECOM	None
D2-08TD1	8 out	F2-04AD-2 & 2L	16 in	H2-ECOM-F	None
D2-08TD2	8 out	F2-08AD-1	16 in	F2-CP128	None
D2-16TD1-2	16 out	F2-08AD-2	16 in	H2-PBC	None
D2-16TD2-2	16 out	F2-02DA-1 & 1L	16 out	**REMOTE I/O**	
F2-16TD1P	16 in/16 out	F2-02DA-2 & 2L	16 out		
F2-16TD2P	16 in/16 out	F2-4AD2DA	16 in/16 out	H2-ERM	None
D2-32TD1	32 out	F2-8AD4DA-1	32 in/32 out	D2-RMSM	None
D2-32TD2	32 out	F2-8AD4DA-2	32 in/32 out	D2-RSSS	None
AC OUTPUT		F2-02DAS-1	32 out		
D2-08TA	8 out	F2-02DAS-2	32 out		
F2-08TA	8 out	F2-08DA-1	16 out		
D2-12TA	16** out	F2-08DA-2	16 out		
		F2-04RTD	32 in		
		F2-04THM	32 in		

** 4-pt. modules consume eight points. Only the first four points are used.*
*** 12-pt. modules consume 16 points. The first six points are assigned, two are skipped, and then the next six points are assigned. For example, a D2-12TA installed in slot 0 would use Y0-Y5, and Y10-Y15. Y6-Y7, and Y16-Y17 would be unused.*

Step 6: Check the Power Budget

Managing your power resource

When determining the types and quantity of I/O modules you will be using, it is important to remember there is a defined amount of power available from the base power supply.

The chart on the next page indicates the power supplied and used by each DL205 device. The adjacent chart shows an example of how to calculate the power used by your particular system. These charts should make it easy for you to determine if the devices you have chosen will operate within the power budget of your system configuration.

If the I/O you have chosen exceeds the maximum power available from the power supply, you may be able to resolve the problem by using local expansion or remote I/O bases.

DL205 power supply specifications

The table below lists base power supply specifications, including maximum inrush current and maximum power consumed from your power source.

Power budget example

The example on the right shows how to calculate the power budget for the DL205 system. The examples are constructed around a single 9-slot base using the devices shown. It is recommended you construct a similar table for your DL205 system. Follow the steps to the right to determine your power budget.

1. Using a chart similar to the one below, fill in column 2.
2. Using the tables on the next page, enter the current supplied and used by each device (columns 3 and 4). Devices which fall into the "Other" category (Row D) are devices such as the operator interface and the handheld programmer, which also have power requirements, but do not directly plug into the base.
3. Add the current used by the system devices (columns 3 and 4) starting with the CPU slot and put the total in the row labeled "Maximum Current Required" (Row E).
4. Subtract the row labeled "Maximum Current Required" (Row E), from the row labeled "Current Supplied" (Row B). Place the difference in the row labeled "Remaining Current Available" (Row F).
5. If "Maximum Current Required" is greater than "Current Supplied" in either column 3 or 4, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O configuration. Note the auxiliary power supply does not need to supply all the external power. If you need more than the 300mA supplied, you can add an external 24V power supply. This will help keep you within your power budget for external power.

A	Column 1	Column 2	Column 3	Column 4
		Device Type	5VDC (mA)	External Power 24 VDC (mA)
B	CURRENT SUPPLIED			
	Base	9 slot	2,600	300
C	CURRENT REQUIRED			
	CPU SLOT SLOT 0 SLOT 1 SLOT 2 SLOT 3 SLOT 4 SLOT 5 SLOT 6 SLOT 7	D2-260 (CPU) D2-16ND3-2 D2-16ND3-2 D2-16NA D2-08NA-1 D2-16TD1-2 D2-08TA D2-08TA	330 100 100 100 50 200 250 250	0 0 0 0 0 80 0 0
D	OTHER			
	Operator interface Handheld programmer	DV-1000 D2-HPP	150 200	0 0
E	Maximum Current Required		1730	80
F	Remaining Current Available		2600-1520=1080	300-80=220

Power Supply Specifications			
Specification	AC Powered Bases	24 VDC Powered Bases	125 VDC Powered Bases
Part Numbers	D2-03B-1, D2-04B-1, D2-06B-1, D2-09B-1	D2-03BDC1-1, D2-04BDC1-1, D2-06BDC1-1, D2-09BDC1-1	D2-03BDC-2, D2-04BDC-2, D2-06BDC2-1, D2-09BDC2-1
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10MΩ at 500 VDC		
Input Voltage Range	85-132 VAC (110 range) 170-264 VAC (220 range) 47-63Hz	10.2-28.8 VDC (24 VDC) with less than 10% ripple	100-264 VDC (125 VDC) with less than 10% ripple
Auxiliary 24 VDC Output	300mA max.	none	300mA max.
Maximum Inrush Current	30A	10A	20A
Maximum Power	80 VA	25W	30W

Power Requirements

These charts help determine your power requirements

This section shows the amount of power supplied by each of the base power supplies and the amount of power consumed by each DL205 device. The Power Consumed charts list how much INTERNAL power from each power source is required for the DL205 devices. Use this information when calculating the power budget for your system.

In addition to the internal power sources, the DL205 bases offer a 24 VDC auxiliary power supply with external power connections. This auxiliary power supply can power external devices.

Use *ZIP*Links to reduce power requirements

If your application requires a lot of relay outputs, consider using the ***ZIP***Link AC or DC relay output modules. These modules can switch high current (10A) loads without putting a load on your base power budget. Refer to the Terminal Blocks and Wiring Solutions section in this catalog for more information.

This logo is placed next to the I/O modules that are supported by the ***ZIP***Link connection systems. See the I/O module specifications at the end of this section.

Power Supplied

Device	Price	5V(mA)	24V Auxiliary	Device	Price	5V(mA)	24V Auxiliary
Bases				**Bases**			
D2-03B-1	<--->	2600	300	D2-06BDC1-1	<--->	2600	None
D2-03BDC1-1	<--->	2600	None	D2-06BDC2-1	<--->	2600	300
D2-04B-1	<--->	2600	300	D2-09B-1	<--->	2600	300
D2-04BDC1-1	<--->	2600	None	D2-09BDC1-1	<--->	2600	None
D2-06B-1	<--->	2600	300	D2-09BDC2-1	<--->	2600	300

Power Consumed

Device	5V(mA)	24V Auxiliary
CPUs		
D2-230	120	0
D2-240	120	0
D2-250-1	330	0
D2-260	330	0
H2-WPLC*-**	680	0
DC Input Modules		
D2-08ND3	50	0
D2-16ND3-2	100	0
D2-32ND3	25	0
D2-32ND3-2	25	0
AC Input Modules		
D2-08NA-1	50	0
D2-08NA-2	100	0
D2-16NA	100	0
Input Simulator Module		
F2-08SIM	50	0
DC Output Modules		
D2-04TD1	60	20
D2-08TD1	100	0
D2-08TD2	100	0
D2-16TD1-2	200	80
D2-16TD2-2	200	0
F2-16TD1P	70	50
F2-16TD2P	70	50
D2-32TD1	350	0
D2-32TD2	350	0
AC Output Modules		
D2-08TA	250	0
F2-08TA	250	0
D2-12TA	350	0
Relay Output Modules		
D2-04TRS	250	0
D2-08TR	250	0
F2-08TR(S)	670	0
D2-12TR	450	0
Combination In/Out Module		
D2-08CDR	200	0

Power Consumed

Device	5V(mA)	24V Auxiliary
Analog Modules		
F2-04AD-1	50	80
F2-04AD-1L	50	90 mA @ 12V
F2-04AD-2	60	80
F2-04AD-2L	60	90 mA @ 12V
F2-08AD-1	50	80
F2-08AD-2	50	80
F2-02DA-1	40	60 (note 1)
F2-02DA-1L	40	70 @ 12V (note 1)
F2-02DA-2	40	60
F2-02DA-2L	40	70 @ 12V
F2-02DAS-1 F2-02DAS-2	100 100	50 / channel 60 / channel
F2-08DA-1	30	50 (note 1)
F2-08DA-2	60	140
F2-4AD2DA	60	80 (note 1)
F2-8AD4DA-1	35	100 (note 1)
F2-8AD4DA-2	35	80 (note 1)
F2-04RTD	90	0
F2-04THM	110	60
Specialty Modules		
D2-CTRINT	50*	0
D2-CM / D2-EM	100/130	0
H2-CTRIO	400	0
D2-DCM	300	0
F2-DEVNETS	160	0
F2-SDS-1	160	0
H2-PBC	530	0
H2-EBC(-F)	450, (640)	0
H2-ECOM(-F)	450, (640)	0
H2-ECOM100	300	0
F2-CP128	235	0
Remote I/O		
H2-ERM(-F)	320, (450)	0
D2-RMSM	200	0
D2-RSSS	150	0
Programming Devices		
D2-HPP	200	0

*requires external 5VDC for outputs
Note 1: Add an additional 20 mA per output loop.

Power Consumed

Device	5V(mA)	24V Auxiliary
Operator Interface		
DV-1000	150	0
C-more Micro-Graphic	210	0

Dimensions and Installation

Understanding the installation requirements for your DL205 system will help ensure that the DL205 products operate within their environmental and electrical limits.

Plan for safety

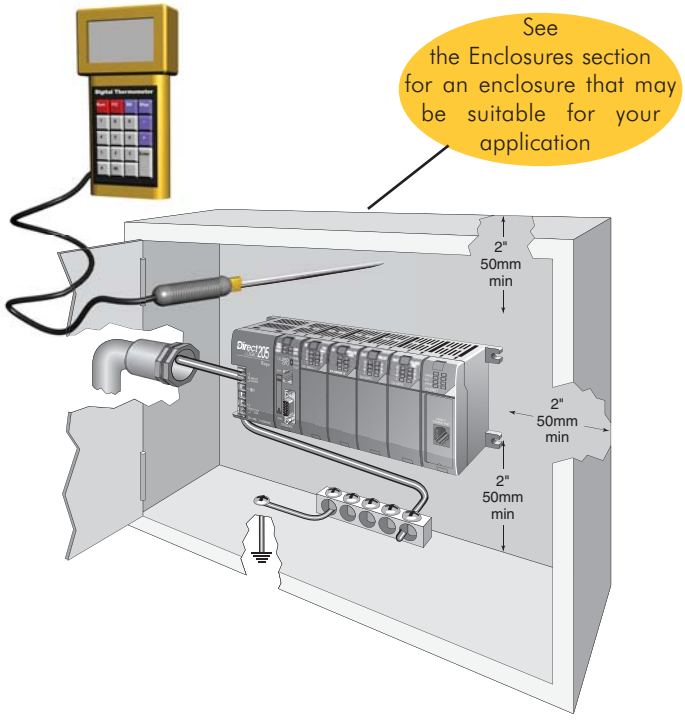
This catalog should never be used as a replacement for the user manual. The user manual, D2-USER-M (sold separately or downloadable online), contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Environmental specifications

The Environmental Specifications table at the right lists specifications that apply globally to the DL205 system (CPUs, bases, and I/O modules). Be sure that the DL205 system is operated within these environmental specifications.

Base dimensions and mounting

Use the diagrams below to make sure the DL205 system can be installed in your application. To ensure proper airflow for cooling purposes, DL205 bases must be mounted horizontally. It is important to check these dimensions against the conditions required for your application. For example, it is recommended that approximately 3" of space is left in front PLC surface for ease of access and cable clearances. Also, check the installation guidelines for recommended cabinet clearances.



Environmental Specification	Rating
Storage Temperature	-4°F - 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F - 131°F (0°C to 55°C)
Ambient Humidity	30%-95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD 810C, Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Base	A		B		C		D	
D2-03B-1, D2-03BDC1-1	6.77"	172mm	6.41"	163mm	5.8"	148mm	7.24"	184mm
D2-04B-1, D2-04BDC1-1	7.99"	203mm	7.63"	194mm	7.04"	179mm	8.46"	215mm
D2-06B-1, D2-06BDC1-1, D2-06BDC2-1	10.43"	265mm	10.07"	256mm	9.48"	241mm	10.90"	277mm
D2-09B-1, D2-09BDC1-1, D2-09BDC2-1	14.09"	358mm	13.74"	349mm	13.14"	334mm	14.56"	370mm